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A TRACE CONTAMINANT ANALYSIS TEST ON AIR SAMPLES PHASE II

J. R. McCabe
ARO, Inc.

February 1967

ENGINEERING SUPPORT FACILITY
ARNOLD ENGINEERING DEVELOPMENT CENTER
AIR FORCE SYSTEMS COMMAND
ARNOLD AIR FORCE STATION, TENNESSEE

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FOREWORD

The work reported herein was done at the request of the USAF School of Aerospace Medicine (SAM) (SMBEC), for the Aerospace Medical Division (AMRM), Air Force Systems Command (AFSC), under Program Element 62405154/7930.

The results of tests presented were obtained by ARO, Inc. (a subsidiary of Sverdrup & Parcel and Associates, Inc.), contract operator of the Arnold Engineering Development Center (AEDC), AFSC, Arnold Air Force Station, Tennessee, under Contract AF 40(600)-1200. The test was conducted under ARO Project No. TG0609 from March 14 through April 10, 1966. The manuscript was submitted for publication on January 9, 1967.

The author wishes to express appreciation to C. Baker, T. R. Hester, F. E. Hood, D. E. McCord, and J. I. Brown for assistance in analysis, sample preparation, and data assimilation associated with this test. The author takes this opportunity to thank also J. A. Baltz, formerly of ARO, Inc., for his aid and assistance in the early phases of the program.

This technical report has been reviewed and is approved.

Frank N. Price, Jr.
Lt. Col., USAF
AF Representative, AEF
Directorate of Test

Leonard T. Glaser
Colonel, USAF
Director of Test

ABSTRACT

Details of transferring and concentrating contaminants from 150-cc stainless steel cryogenic traps to small volume glass traps more suitable to trace analysis and gas chromatographic equipment used in analysis, along with analysis procedures used, are presented. The chromatographic instrumentation, calibrations, and data assimilation procedures are described. Basic test results and observations concerning the utility of procedures used, along with comparative discussions of various aspects of Phase II compared with Phase I, are noted.

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I. ILLUSTRATIONS

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SECTION I
INTRODUCTION

Beginning March 14, 1966, and continuing for 28 consecutive days, a sample set consisting of three 150-cc stainless steel sample bottles (Fig. 1, Appendix I) was used by SAM to cryogenically trap trace contaminants from the atmosphere of closed ecological systems. The bottles were connected in series and maintained respectively at 0, -78, and -175°C. After a trapping interval consisting of continuous circulation of the ecological atmosphere through them, the bottles were valved off, removed from the system, packed in dry ice, and shipped by air freight to AEDC for analysis.

The samples, aside from the trace contaminants which can generally be assumed to be hydrocarbon in nature, contained varying amounts of CO_2, H_2O, and other common gases, but only the trace contaminants and CO_2 were of interest. The primary purpose in analysis was to determine the total mass trapped for each constituent of interest. This need generated requirements for sample transfer equipment which would concentrate contaminants and facilitate the measurement of the total mass trapped by use of standard temperature and pressure (s.t.p.) volume measurements and also weight measurements, and from which samples could be removed for quantitative analysis by gas chromatography.

SECTION II
ANALYTICAL APPARATUS

Analysis during Phase I of this program was accomplished by flame ionization gas chromatography in conjunction with time-of-flight mass spectrometry; analysis by mass spectrometer was on a portion of the total sample at a slow scan rate. However, the relatively small amount of information gained by mass spectrometry, the rather large amount of sample required for mass spectrometer analysis, and the generally superior sensitivity of flame ionization chromatographic analysis over mass spectrometer analysis under these circumstances indicated a shift in emphasis in analytical techniques.* Therefore, analysis during Phase II of this program was confined to gas chromatography.

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*F. G. Sherrell and J. A. Baltz. "A Trace Contaminant Analysis Test on Air Samples." AEDC-TR-66-42 (AD 478886), March 1966.

2.1 SAMPLE PROCESSING APPARATUS

A schematic and photograph of the sample transfer apparatus as used in this test are shown in Fig. 2. Design of this system was a result of experience gained during Phase I of this program. It is essentially a system for measuring the total gas trapped at s.t.p. for individual samples, with provision for removal of trapped portions of the sample for chromatographic analysis via removable glass traps. The system was all glass except for metal portions on each side of the sample trap which connected the sample bottle and transducer to the system on the inlet side and the hypodermic needle to the system on the outlet side.

Sample transfer was accomplished by slowly evacuating gas trapped in the sample bottles through an LN_2 sample trap throttled at the outlet with a hypodermic needle. The bypass line to the sample trap was used only to aid in initial and final evacuation procedures. Sample traps (Fig. 3) themselves were approximately 6 in. long and constructed of 10-mm-ID Pyrex® tubing with attached rubber septum arms; indentations in the tubing near the outlet side acted as baffles against carryover of the sample. From just beyond the hypodermic needle to the 0 position of the constant-volume manometer, the entire system was composed of capillary tubing. This held the dead space of the system to a minimum and allowed maximum concentration of sample in the sample traps. However, in the case of samples with large amounts of CO_2 (Fig. 4), the mercury burets were used to keep the pressure of the system within the pressure range of the constant-volume manometer. During the evacuation procedure the pressure transducer was used to monitor the rate of evacuation. The entire transfer procedure depends upon all contaminants being removed from the gas stream flowing through the LN_2-cooled sample trap. This, of course, from vapor pressure versus temperature considerations, is not strictly true, but the utility of the procedure, combined with the lack of interest in the permanent gases present in the sample other than CO_2, the fact that trapping conditions in sample collecting by SAM had a lower limit of $-175^{\circ}C$, and the absence of more sophisticated procedures, designated the process as a workable one.

After complete transfer of a sample to a sample trap, and following s.t.p. measurements (Fig. 5), the traps were removed from the system and weighed; liquid (Fig. 6) and gaseous portions of the samples were then removed from the traps via the septums with hypodermic syringes for gas chromatographic analysis.

2.2 CHROMATOGRAPHS AND ASSOCIATED EQUIPMENT

Chromatographic equipment used in this test included an F & M Scientific Corporation Model 720 dual column, programmed-temperature gas chromatograph equipped with a Model 1609 flame ionization detector and an F & M Model 810 Research Chromatograph with dual flame ionization detectors and automatic temperature programming recycler. Schematics and photographs of the Models 720 and 810 appear in Figs. 7 and 8, respectively. The chromatographs were in turn hooked up to an Infotronics Corporation Model CRS-11HSB digital readout system equipped with a serial-entry digital printer (Fig. 8b).

The F & M Model 810 served as the principal analytical tool and contained two 6-ft-long, 1/8-in.-OD stainless steel columns packed with 10 percent silicone gum rubber on Chromosorb W. Operating parameters for this instrument, as well as for all others used in this test, were experimentally determined by synthetic standards to be those which would yield best overall results in the analysis of SAM samples and are listed in Table I (Appendix II).

The F & M Model 720 was used in both the flame ionization and the thermal conductivity modes of operation. The flame ionization unit served as a complementary analytical tool to the Model 810 and contained a 24-ft-long, 1/4-in.-OD stainless steel column packed with 10 percent Carbowax 20 M on Chromosorb W. Whereas the silicone gum rubber column is more suitable for analysis of nonpolar materials, the Carbowax 20 M column is more suitable for polar materials and as such provided information which served to resolve insufficiencies in the Model 810 analysis, e.g., lack of resolution between certain pairs of compounds such as diethyl ether and isopropyl alcohol, acetaldehyde and methanol. One disadvantage and peculiarity of the Carbowax 20 M column was that gas samples could not always be run because of attendant instability of operation; therefore, in a number of cases liquid samples only were analyzed on this column. Independent analyses of SAM samples by two separate instruments was also useful as a crosscheck on the effectiveness and utility of analytical procedures on a day-to-day basis. Operating parameters of the 720 in the flame ionization mode are listed in Table II.

The thermal conductivity unit of the Model 720 was used to determine the CO_2 content of the samples. It contained a 12-in.-long, 1/4-in.-OD copper tube column packed with high activity silica gel. Operating parameters of the 720 in the thermal conductivity mode are listed in Table II.

The output of the Model 720 in both modes of operation and the Model 810 was fed to the digital readout system which provided automatic printing of peak integrals in numerical form along with elapsed time to peak crest retention times. Instrument settings of the readout system were selected for consistency with trace analysis requirements and are listed in Table III.

SECTION III
CHROMATOGRAPH CALIBRATIONS

The exact nature and number of hydrocarbon or other type of compounds to be expected in the cryogenic samples was not known exactly, but Phase I of this test - in which 30-odd compounds were found - served as a guide for the general types of structures to be expected; these included olefinic and aromatic hydrocarbons, cyclic, branched, and normal paraffins as well as alcohols, aldehydes, ketones, halogenated hydrocarbons, esters, ethers, and heterocyclic compounds. In all, 81 compounds were catalogued as to sensitivity and retention time on the 810 and 14 on the 720. These values are catalogued in Tables IV and V, respectively.

Standard mixes were prepared by making either a water solution of the compound of interest in 1-ℓ (volumetric) flasks or by injecting a known weight of pure liquid or known volume of pure gas into an evacuated 34-ℓ surplus oxygen tank (Fig. 9). Concentrations were 0.0001 mg/$\mu\ell$ in the case of liquid mixes and 0.0002 mg/cc in the case of the gas mixes. As many as ten components were mixed in the gas phase and seven in the liquid phase. Gas mixes, after the desired components were injected into the evacuated tank, were brought to atmospheric pressure with helium and homogenized by running hot water over one end of the tank for 16 hr. Table VI contains typical quantitative data obtained from two calibration mixtures on the Model 810, and Figs. 10 and 11 show the chromatographic trace of these mixtures. Table VI and Fig. 12 show similar data from the Model 720.

SECTION IV
ANALYTICAL PROCEDURES

4.1 SAMPLE TRANSFER

The analysis of each SAM sample started with the installation of the sample bottle on the transfer apparatus and

proceeded thereafter as follows:

1. System Evacuation - With stopcocks 1 and 3 open, stopcocks 2 and 4 closed, the mercury raised in all burets, and the mercury down in the constant-volume manometer, the system was evacuated using a mechanical pump system, flamed where necessary.

2. Leak Check - With all stopcocks closed, the system was checked for leaks by monitoring the readout of the pressure transducer.

3. Sample Transfer - With the transfer system evacuated and stopcocks 1, 2, 3, and 4 closed, the sample trap was cooled to LN_2 temperature, and the valve on the SAM sample bottle slowly cracked to permit transfer of the sample. The pressure transducer was used to monitor system pressure during transfer; pressure rise was limited to 10 or 20 mm/min.

4. Air Removal - After the system pressure had stopped rising - as indicated by the transducer - and with the valve on the SAM sample bottle open, air in the system was slowly pumped out by opening stopcock 3. At the same time, the sample bottle was heated gently and finally, after the system had reached a pressure of several millimeters, stopcock 1 was opened to aid in the final evacuation of air.

5. S.T.P. and Weight Measurements - After stopcocks 1 and 3 were closed, the mercury was raised in the constant-volume manometer and the sample trap isolated from the rest of the system except via the hypodermic needle by sealing off and separating with a torch the upper arms of the trap at marked points of constriction. The LN_2 dewar was then lowered away from the sample trap and the trap allowed to warm. The mercury in the constant-volume manometer was continually adjusted to compensate for pressure changes as the trap warmed. If the sample contained larger amounts of CO_2 than could be handled in the capillary portion of the system, the mercury in the calibrated burets was lowered to maintain between 800 and 900 mm of Hg. If the sample contained only a small amount of CO_2 and the resulting pressure on warming was below atmospheric, gaseous helium (GHe) was introduced through stopcock 4 to bring the pressure to between 800 and 900 mm in the system.

   After all adjustments were final and the volumes and pressures noted, the trap was removed from the system

by pulling the rubber septum off the connecting hypodermic needle. The system was vented by closing stopcock 3 and slowly opening stopcock 2. The traps were then weighed and the mass of liquid (assumed to be H_2O) was calculated by subtracting the empty weight of the trap, determined after analysis and adjusted for the difference in density between CO_2 or He and air as appropriate.

The system was then readied for another sample by sealing a new trap with a known volume in the system with the hypodermic needle inserted through the rubber septum on the side of the trap containing baffles.

4.2 CHROMATOGRAPH ANALYSIS PROCEDURE

Portions of liquid, where present, and gas were removed via the rubber septums for analysis. Sample sizes were always 2 $\mu\ell$ of liquid and 1 cc of gas. Liquid samples were removed first to maintain equilibrium as much as possible. By using the calibration data in Tables IV and V and the determined weights and volumes for each sample, peak identification was made for resulting chromatograms.

SECTION V
TEST RESULTS AND TYPICAL CHROMATOGRAMS

In keeping with basic test requirements, the total mass trapped of each quantitatively identified compound in each SAM sample is reported in Table VII. Quantities are identified in both the liquid and vapor phases along with the totals for each set. For cases where identifiable peaks were too small to be integrated, the designation for quantity found is <0.00001 mg. Included under remarks are short statements concerning all peaks not identified for each set of samples.

Figures 13 through 15 show typical background effects of CO_2, H_2O, and temperature programming; these were taken into account in the analysis of chromatograms. Peaks are identified numerically according to retention data taken from Tables IV and V. Shown in Figs. 16 through 22 is a set of chromatograms taken on a typical set of SAM samples.

SECTION VI
CONCLUSIONS

Perhaps the most satisfactory procedure during Phase II of this program was that of transferring samples from SAM sample bottles to the glass traps used in analysis. This transfer procedure was eminently satisfactory in all cases and, aside from some questions such as uniform mixing of gases, provides a basic design which could be further improved and used in this or other similar types of analysis.

In Phase I of this program some 20-odd compounds were identified. With improved instrumentation and techniques, Phase II showed many more materials than this to be present, but with increasing complexity of sample composition positive identification of components using retention data alone becomes insufficient and identification leans more toward judgement-type data than is desirable. The use of two chromatographs utilizing different column materials helped to alleviate this problem, but it is felt that a split of sample as it leaves the chromatograph analyzing column with a portion of the material going to the flame detector and a portion to a direct-hookup, fast scanning, high resolution, high sensitivity, mass spectrometer would do much toward refining the analysis beyond empirical techniques.

One other detail of analysis which would remove or alleviate much struggle would be to transfer calibration data to a computer program and log sample results by any of a number of techniques for analysis by computer. Under the present technique this would not work because of the many judgements which must be made in analyzing a chromatographic trace of a sample, but if this could be used in conjunction with a successful mass spectrometer direct hookup as previously indicated, it shows much promise.

APPENDIXES

I. Illustrations

II. Tables

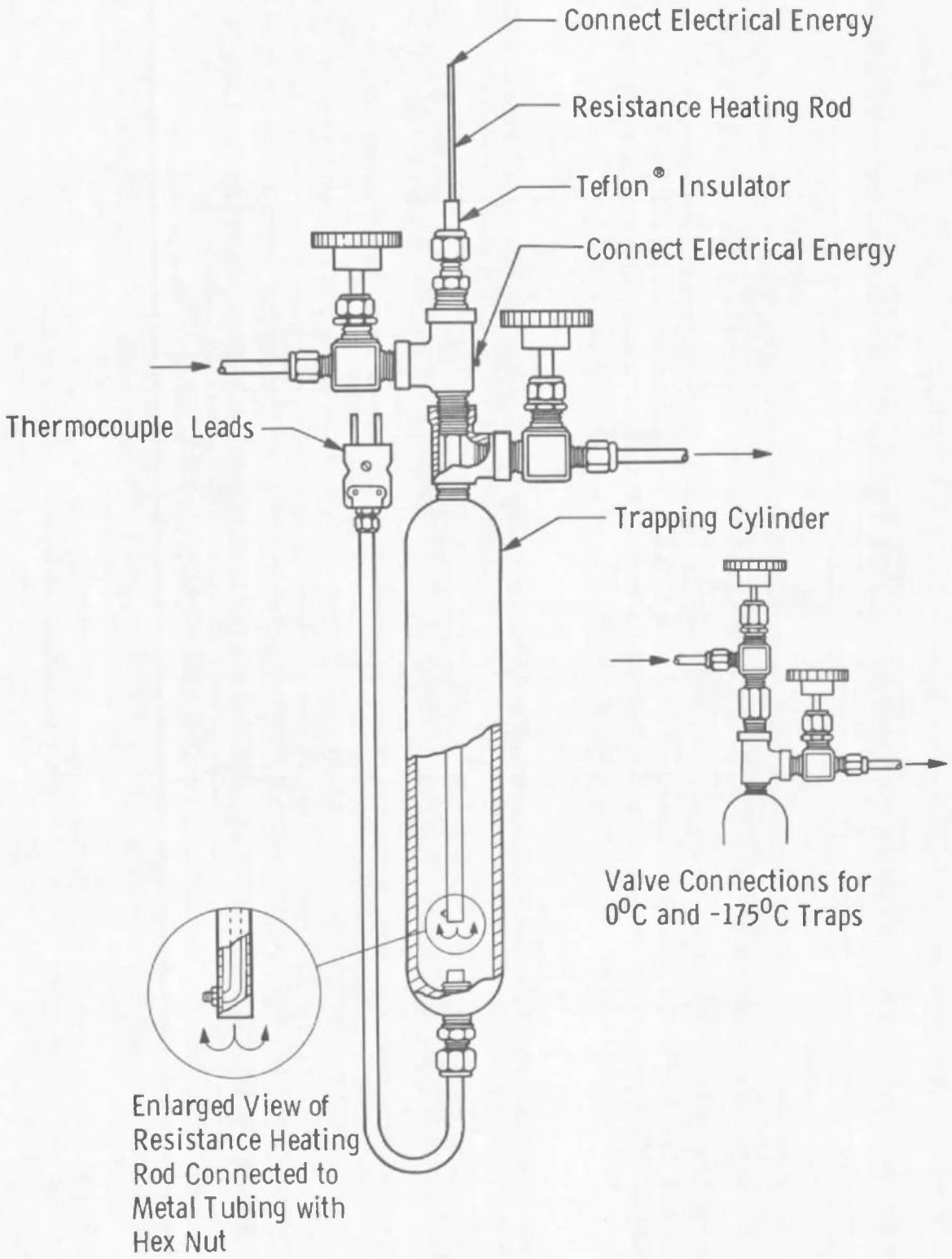
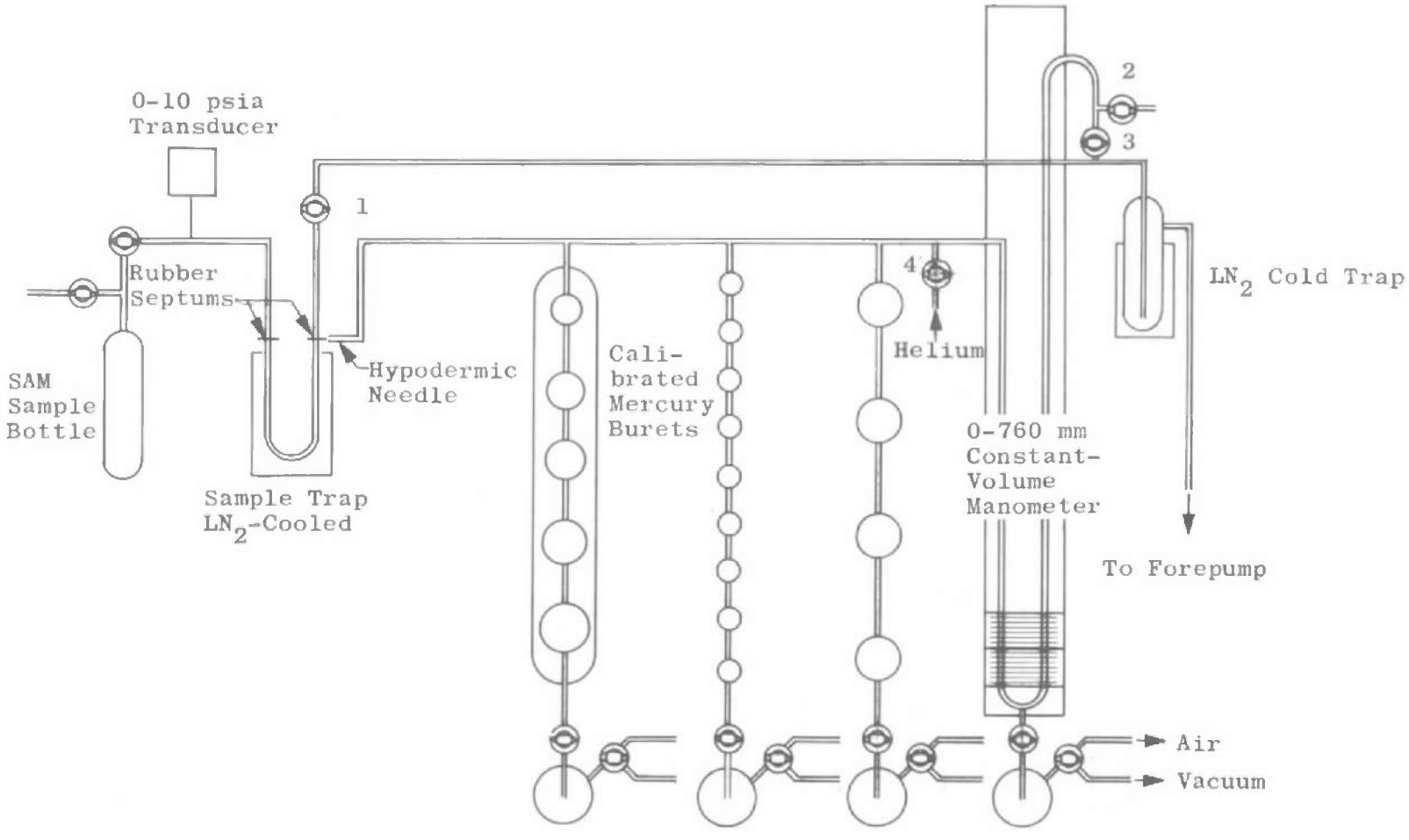
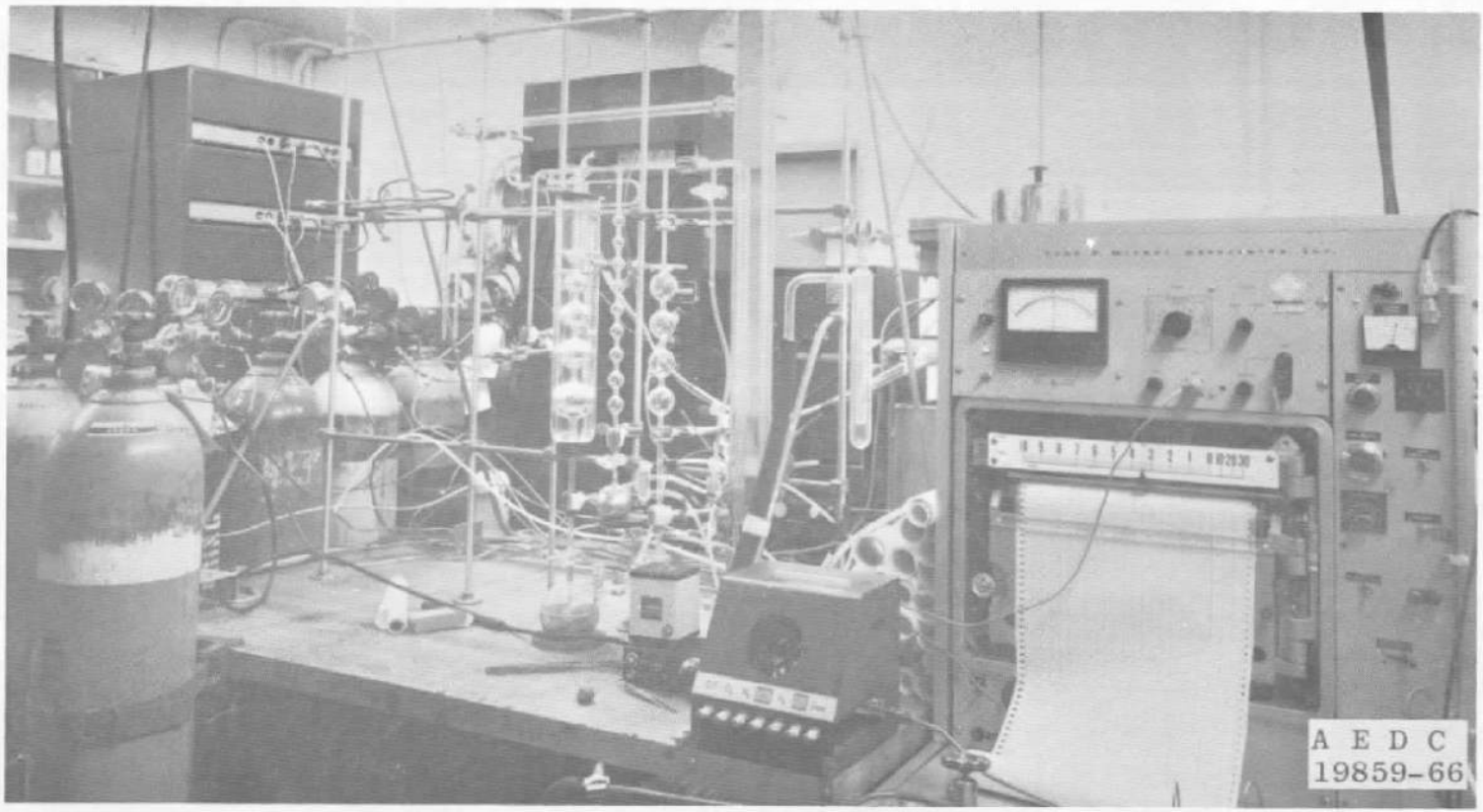


Fig. 1 Multistage Cryogenic Trapping System



a. Schematic

Fig. 2 Sample Processing System



b. Photograph

Fig. 2 Concluded

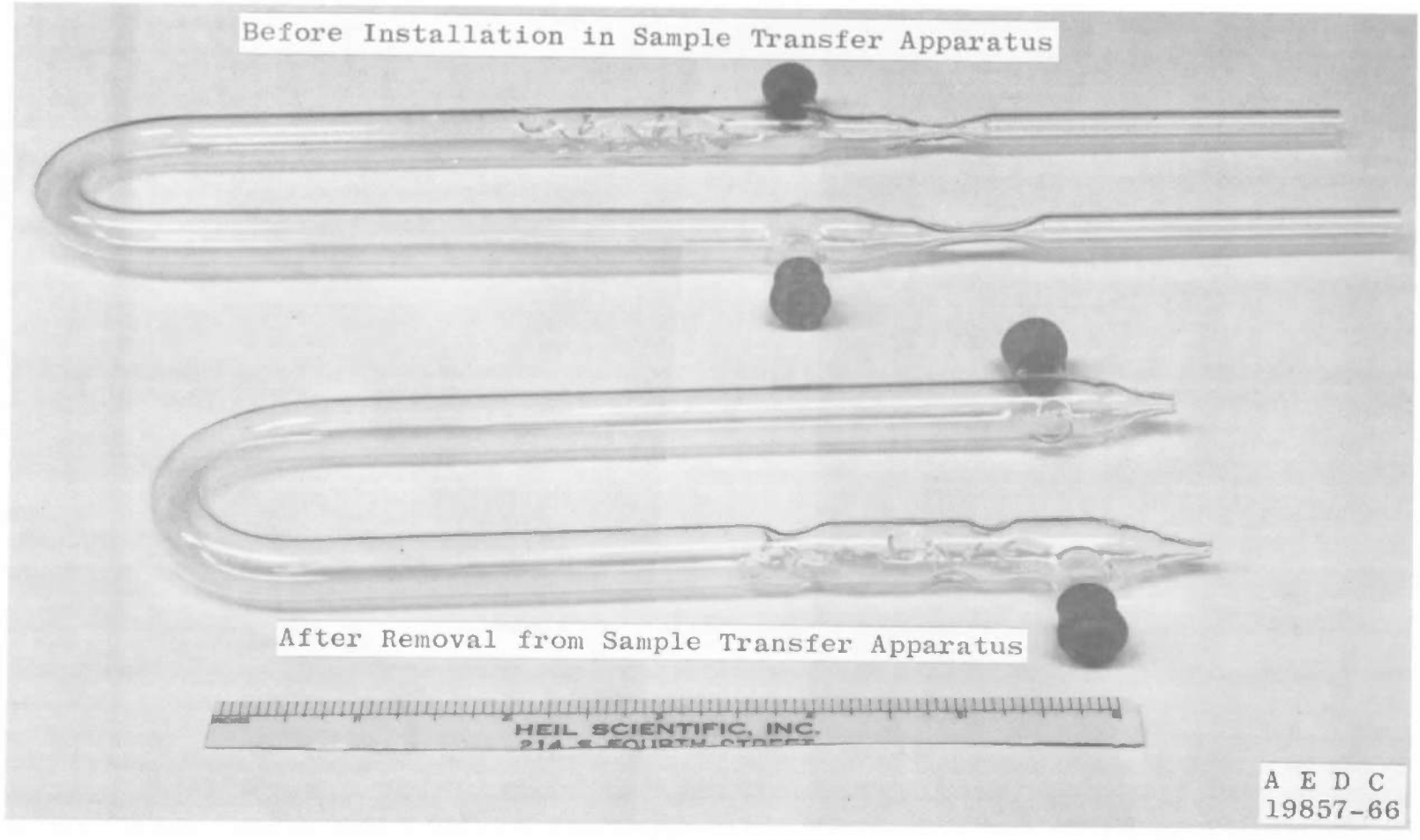


Fig. 3 Photograph of Sample Traps

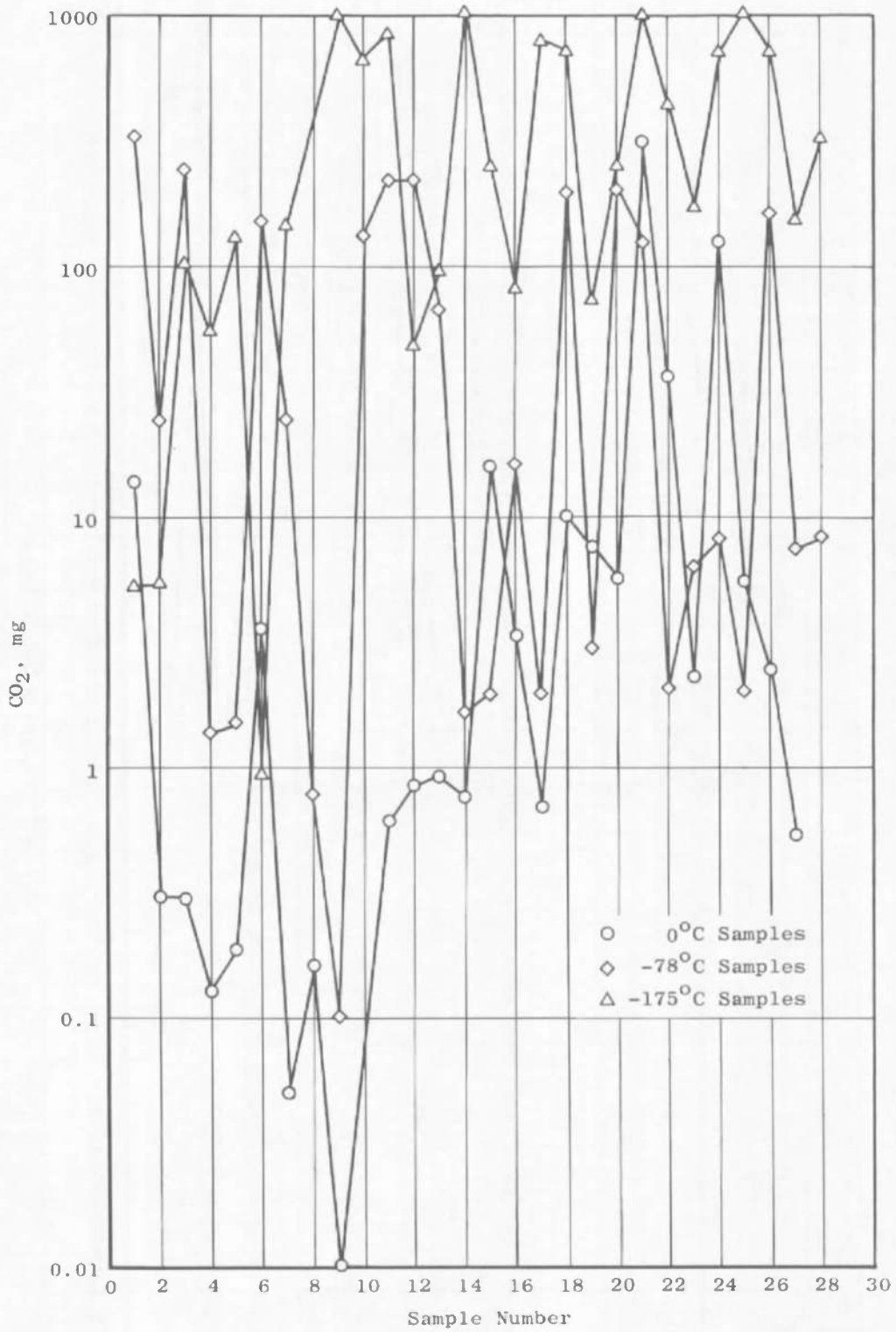


Fig. 4 Chart of CO_2 Content of Samples

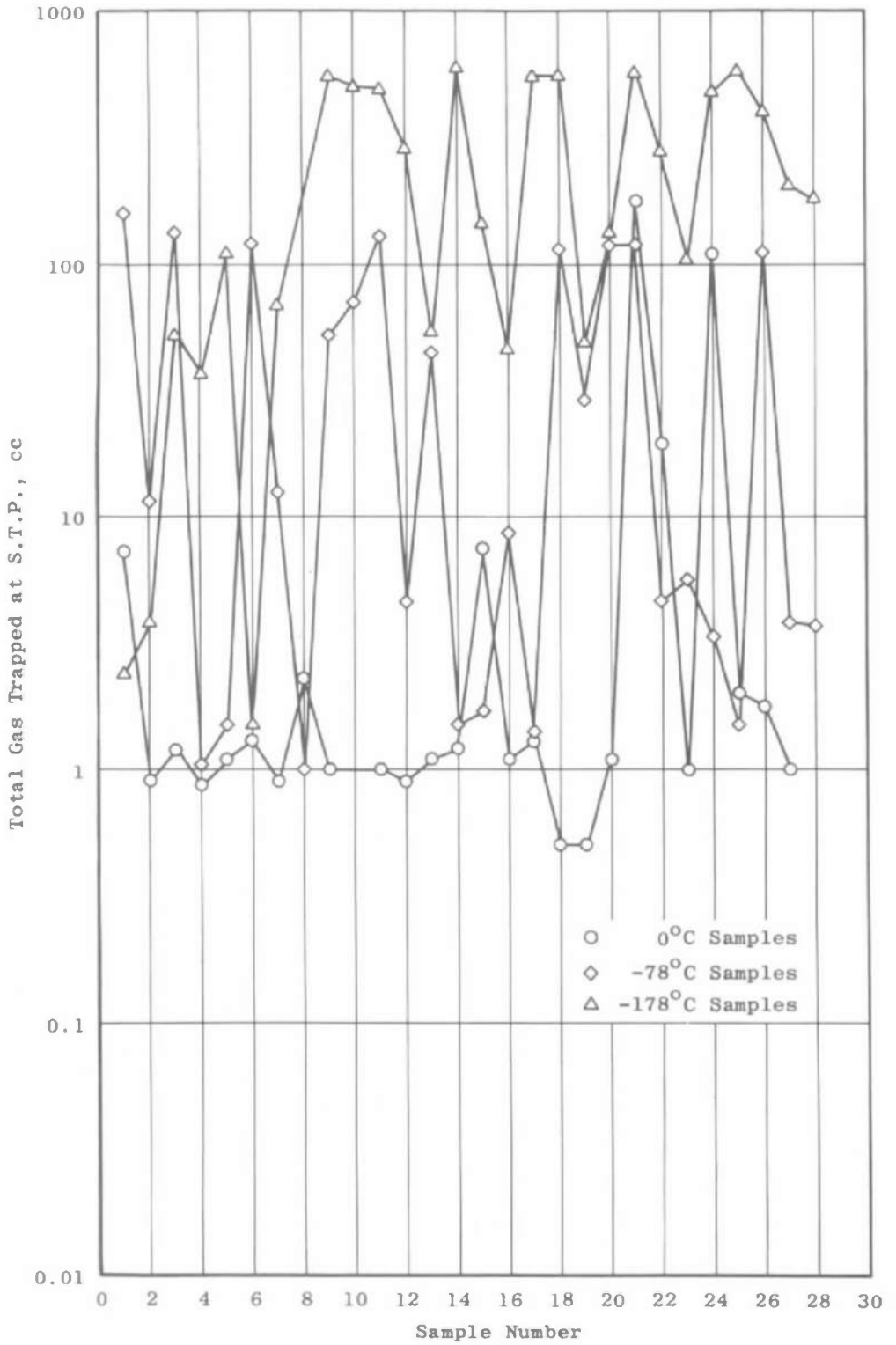


Fig. 5 Chart of S.T.P. Measurements of Samples

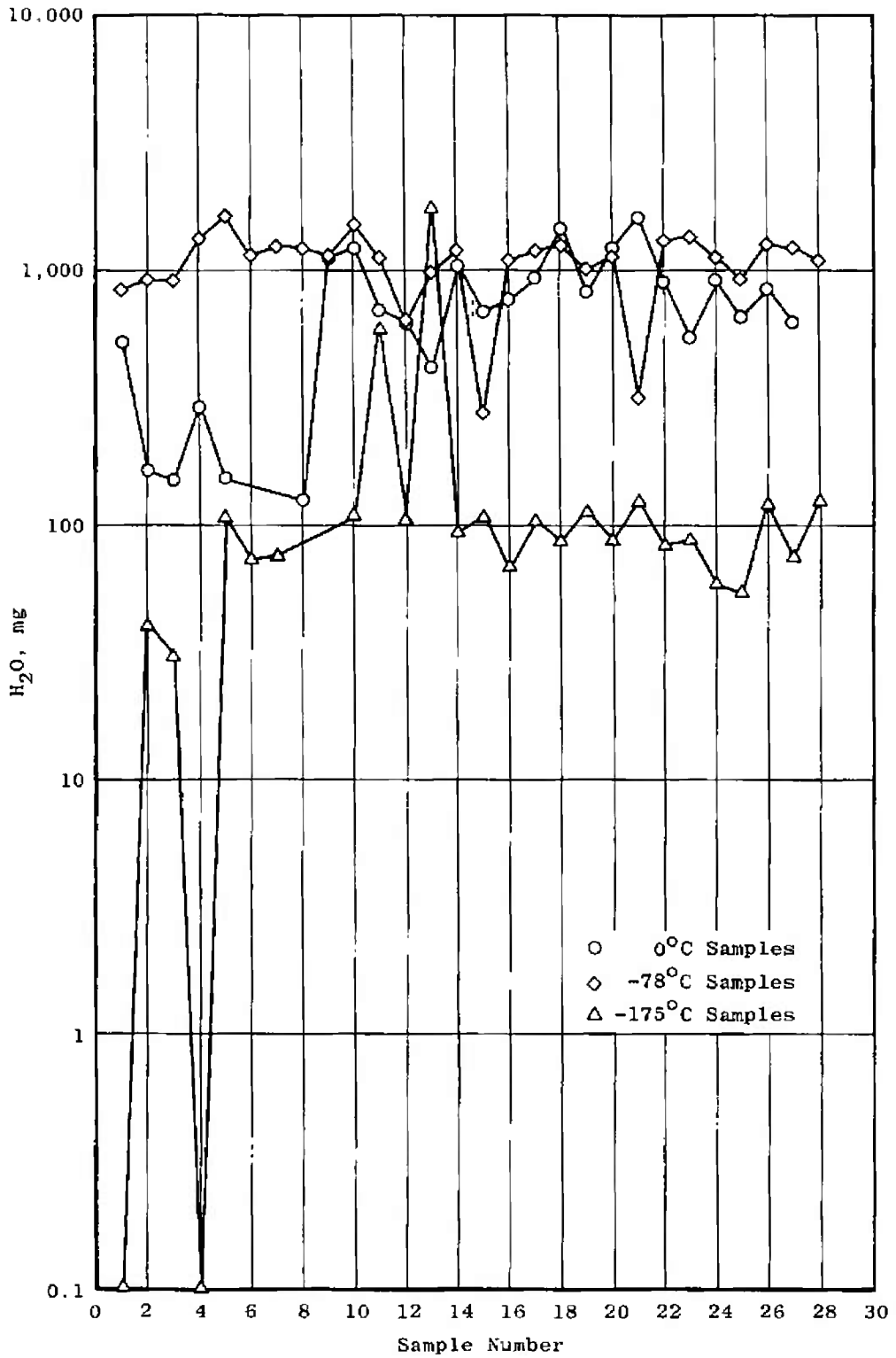
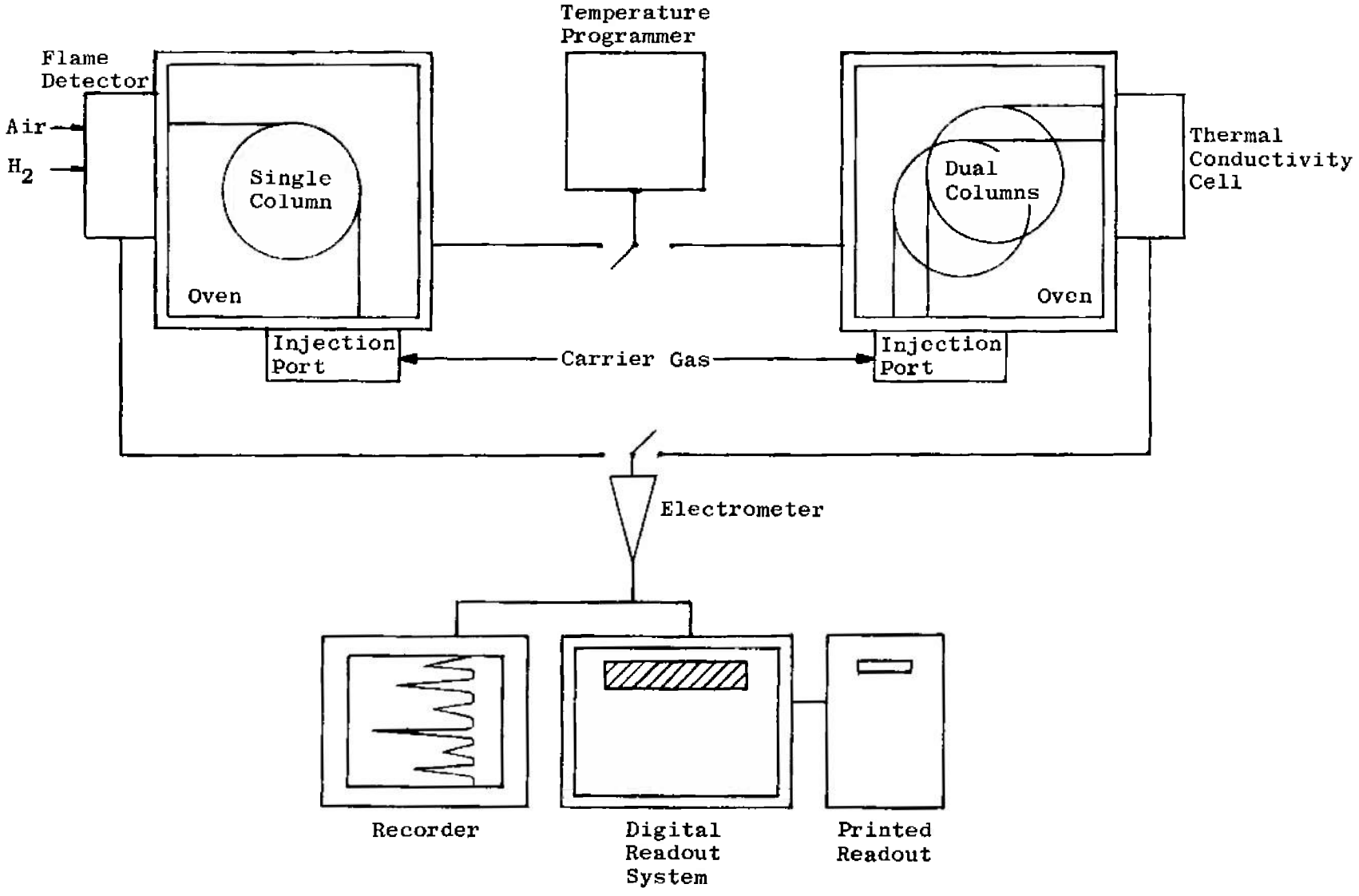
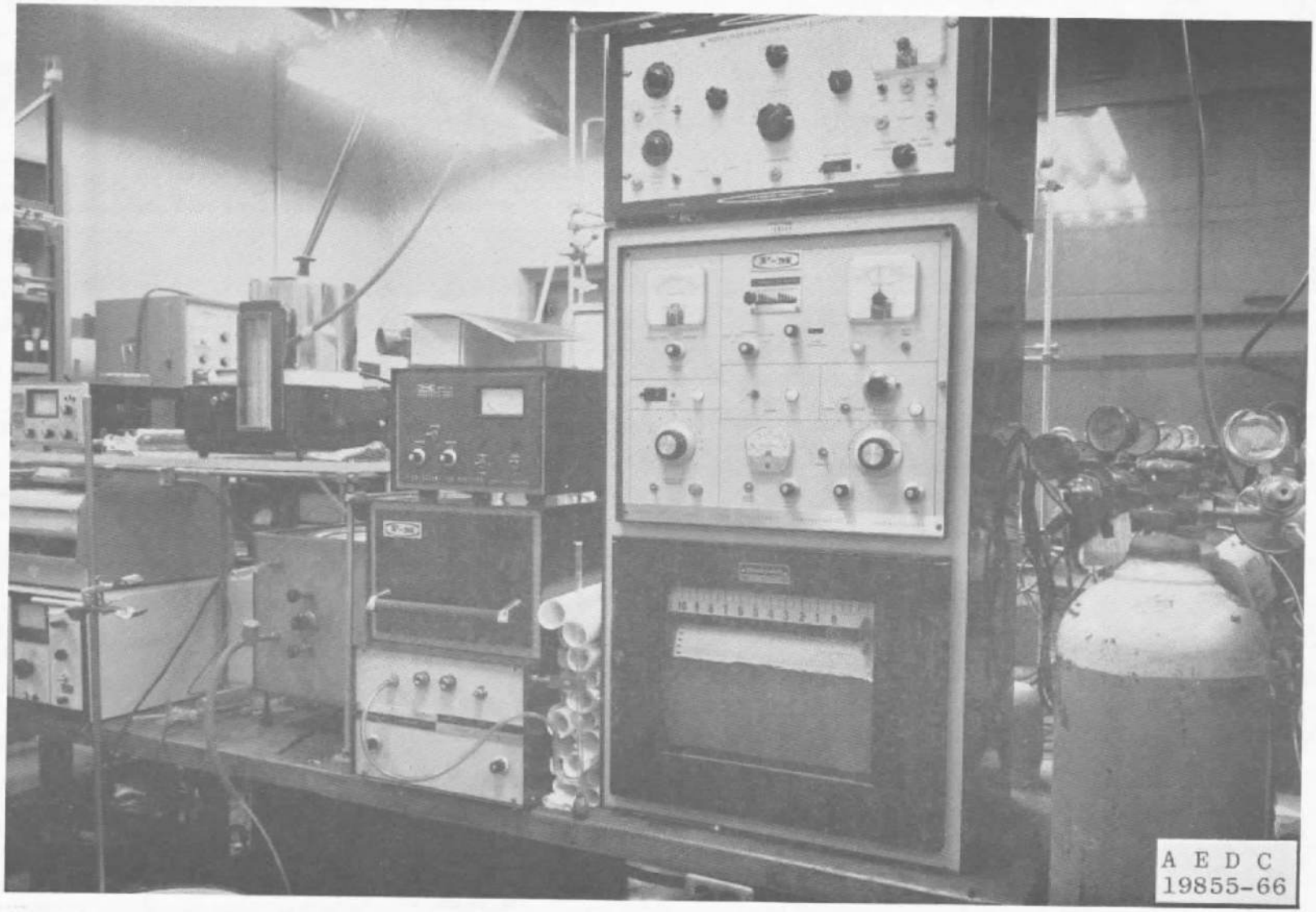


Fig. 6 Chart of Water Content



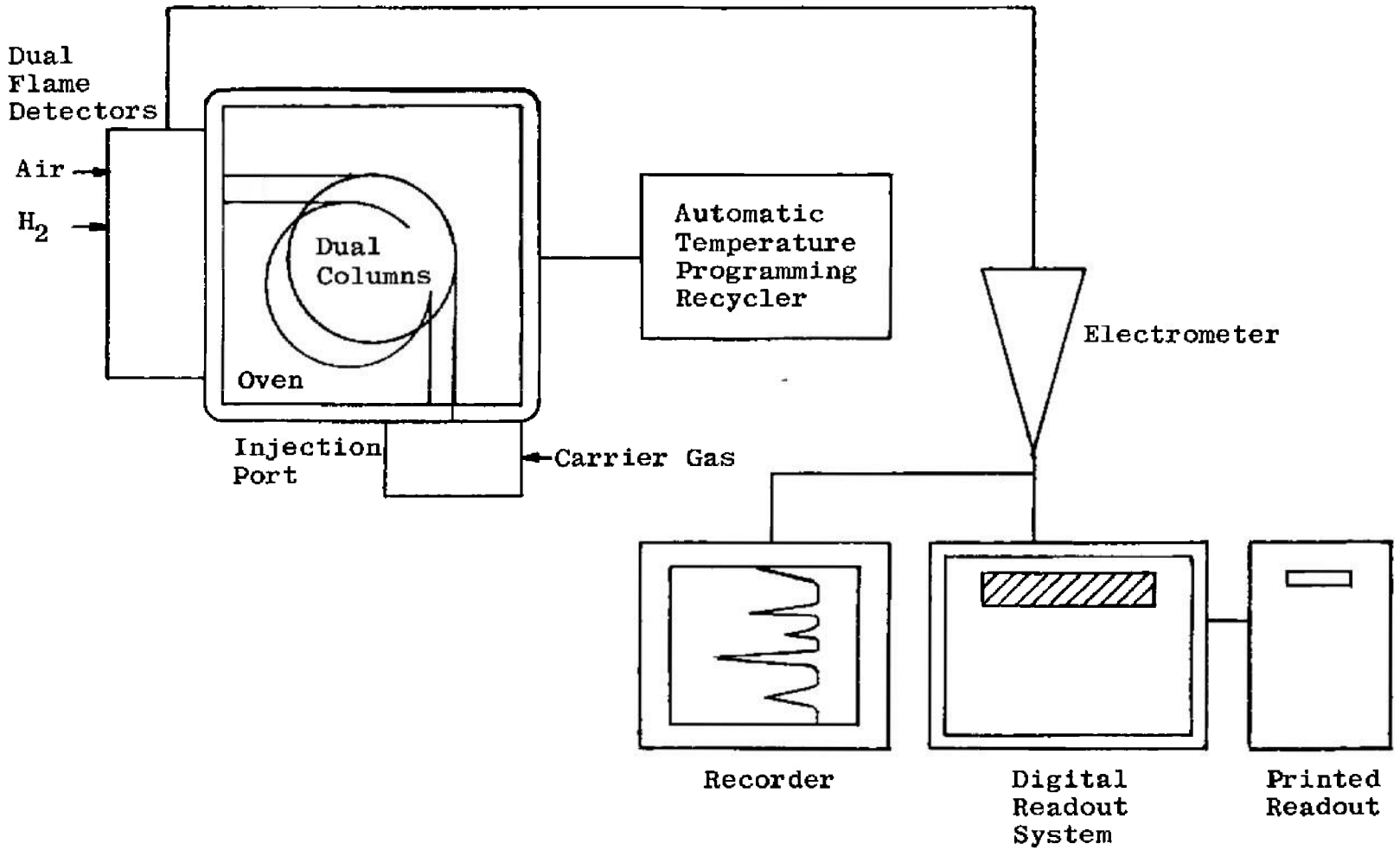
a. Schematic

Fig. 7 F and M Model 720



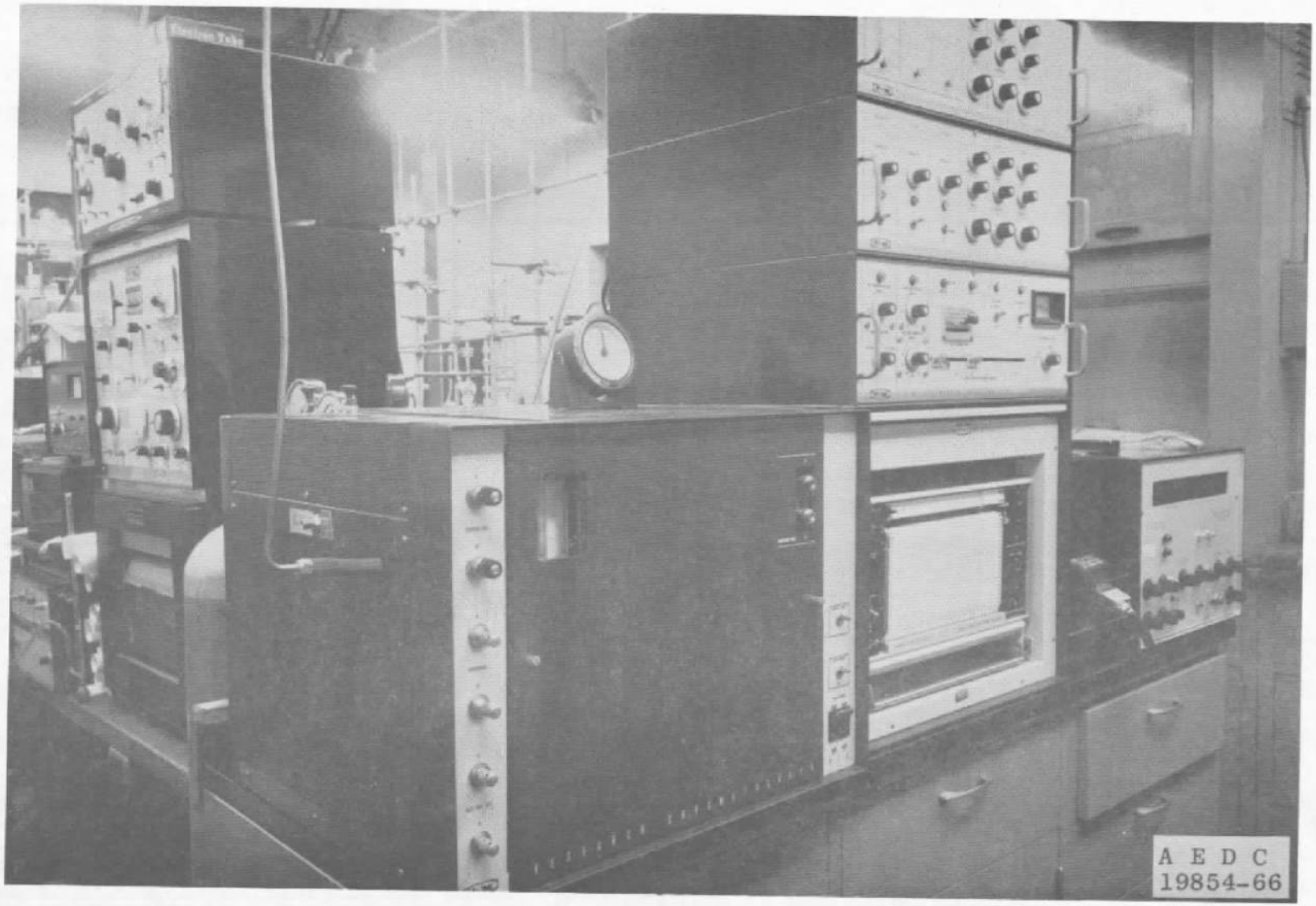
b. Photograph

Fig. 7 Concluded



a. Schematic

Fig. 8 F and M Model 810



b. Photograph

Fig. 8 Concluded

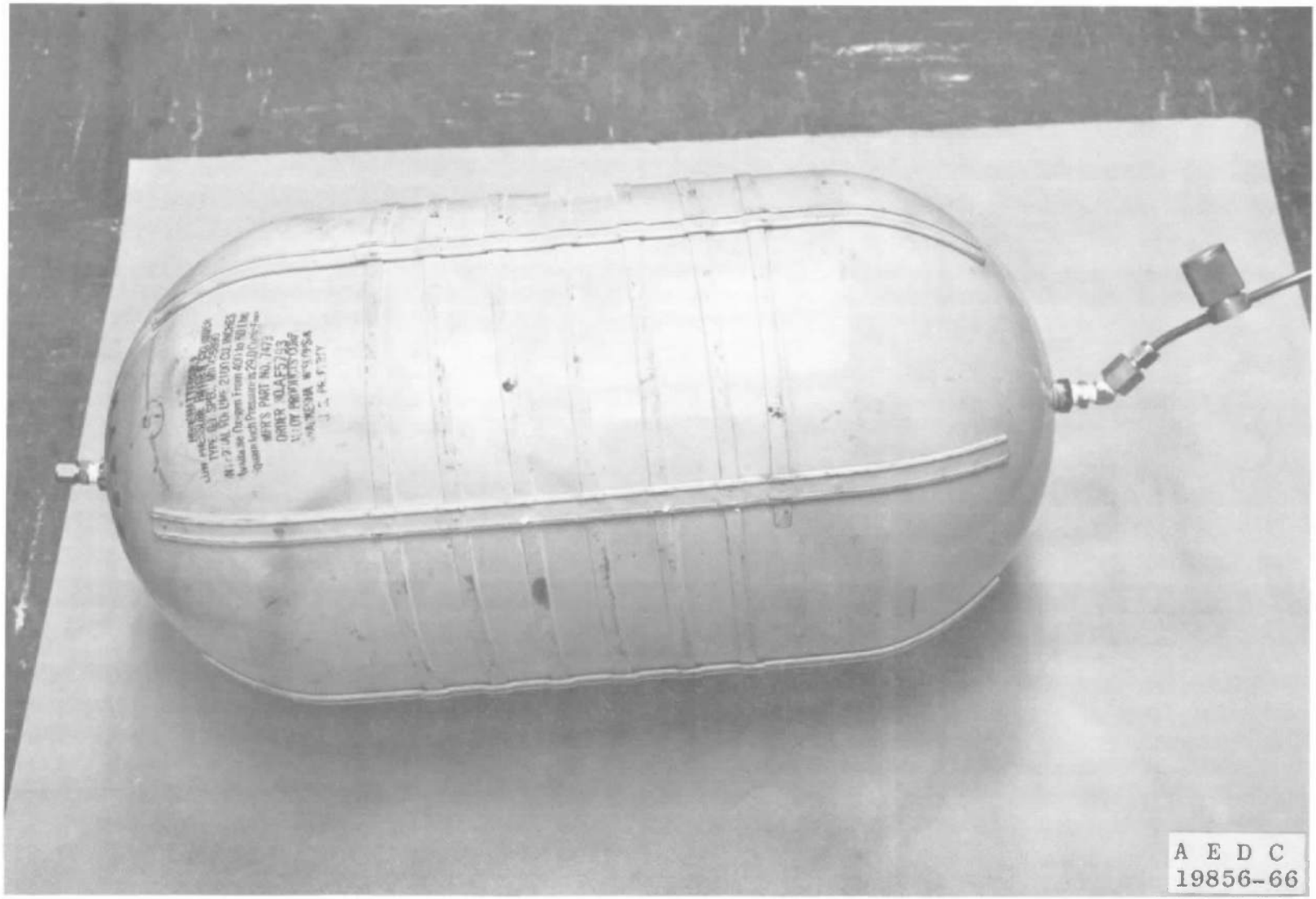


Fig. 9 Photograph of Calibration Tank

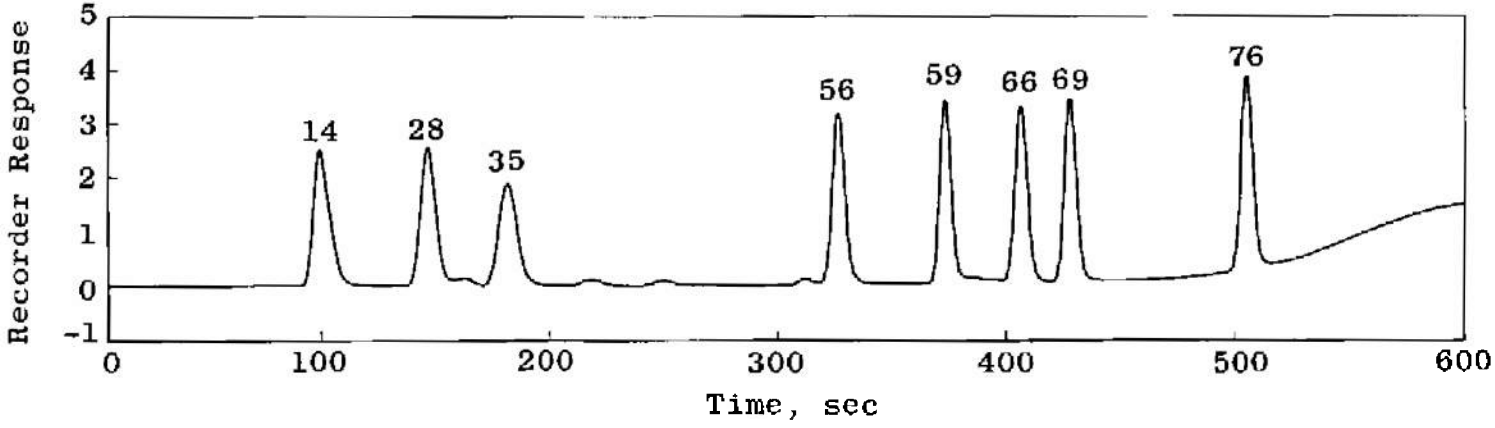


Fig. 10 Calibration Chromatogram, Model 810

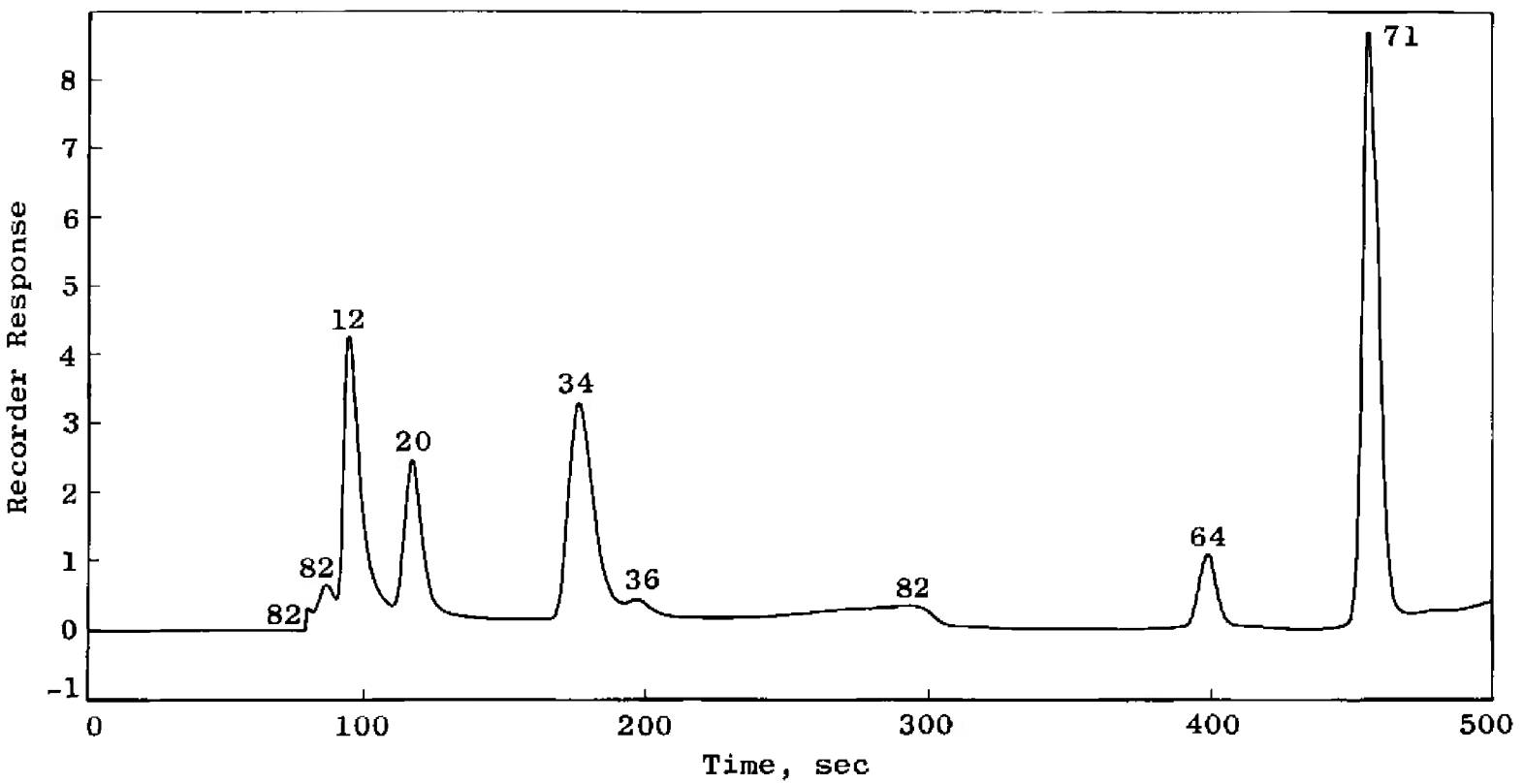


Fig. 11 Calibration Chromatogram, Model 810

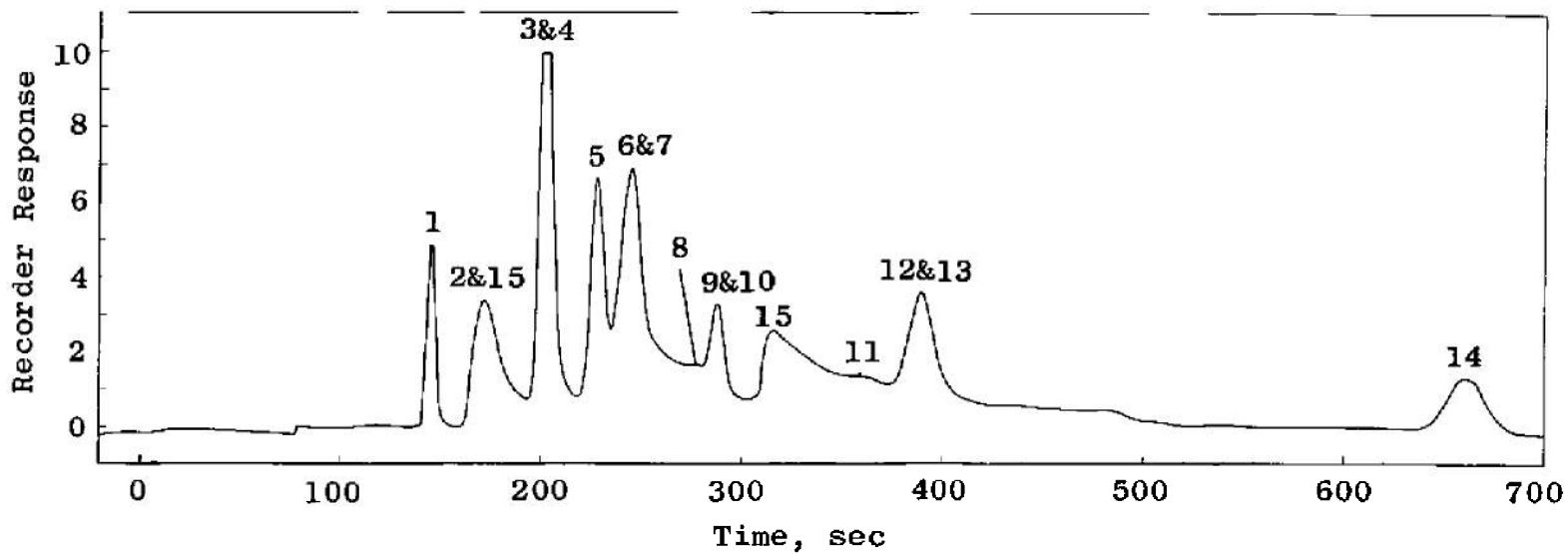


Fig. 12 Calibration Chromatogram, Model 720

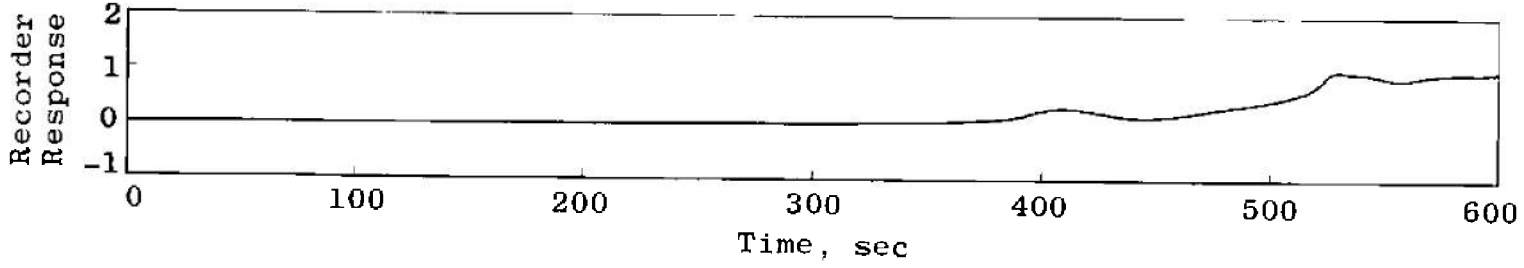


Fig. 13 1 cc CO_2, Model 810

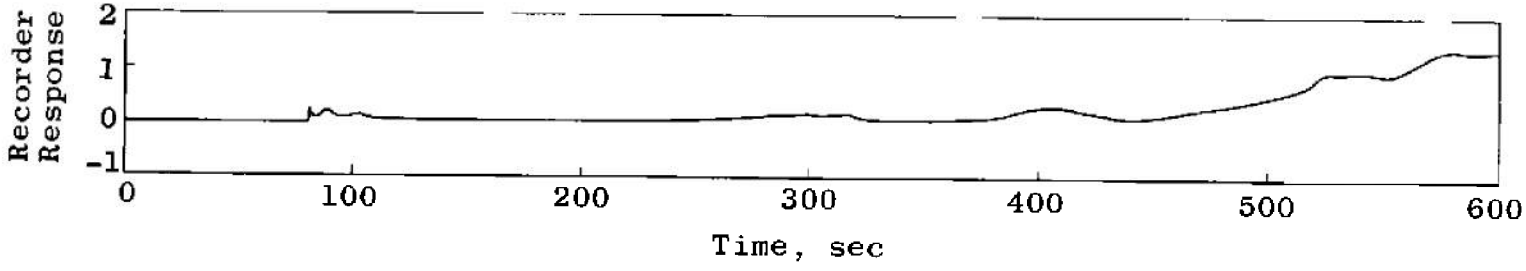


Fig. 14 2 $\mu\ell$ Water, Model 810

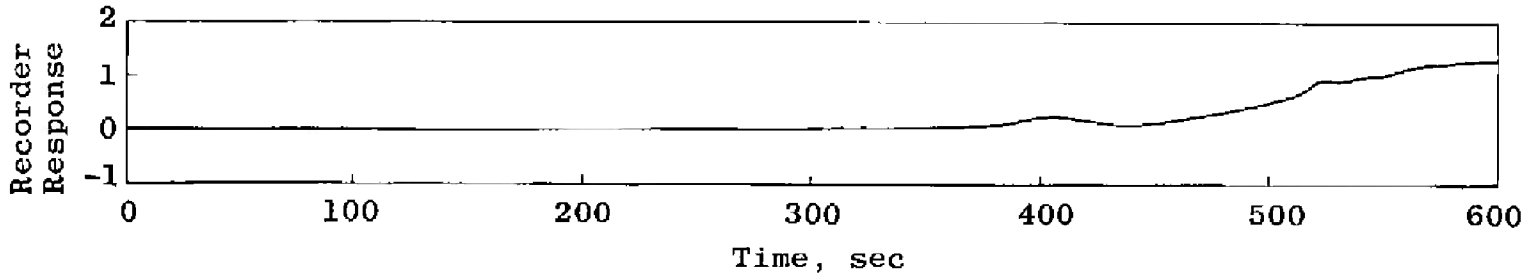


Fig. 15 Blank, Programmed Run, Model 810

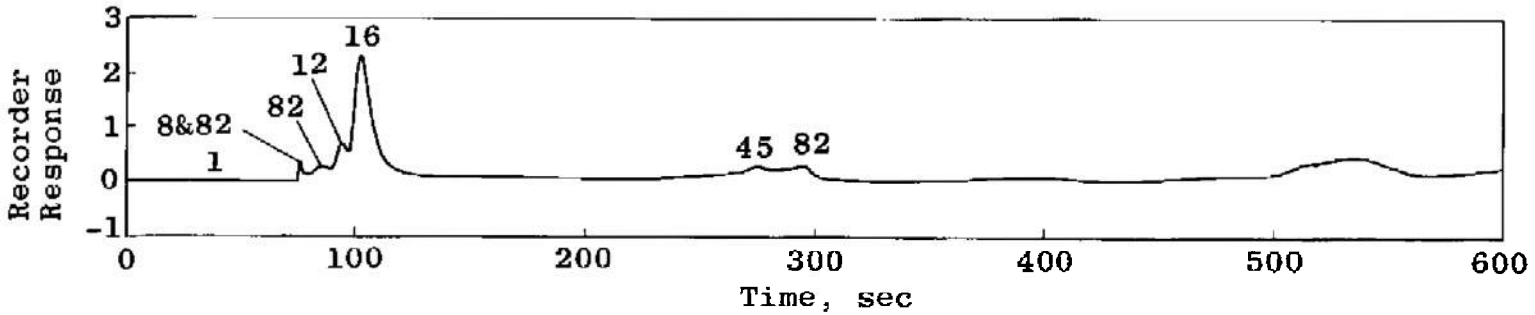


Fig. 16 Chromatogram, Set 34, 0°C; 2 $\mu\ell$ Liquid, Model 810

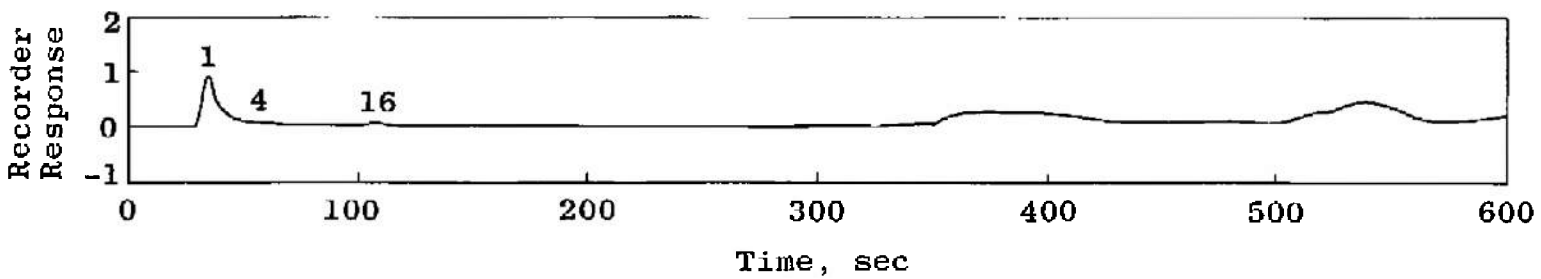


Fig. 17 Chromatogram, Set 34, 0°C; 1 cc Gas, Model 810

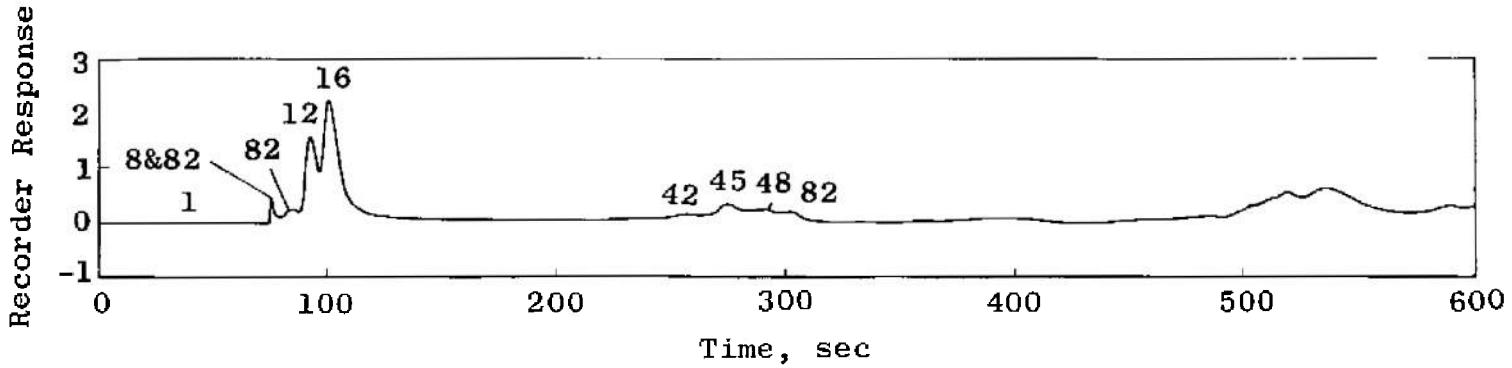


Fig. 18 Chromatogram, Set 34, –78°C; 2 $\mu\ell$ Liquid, Model 810

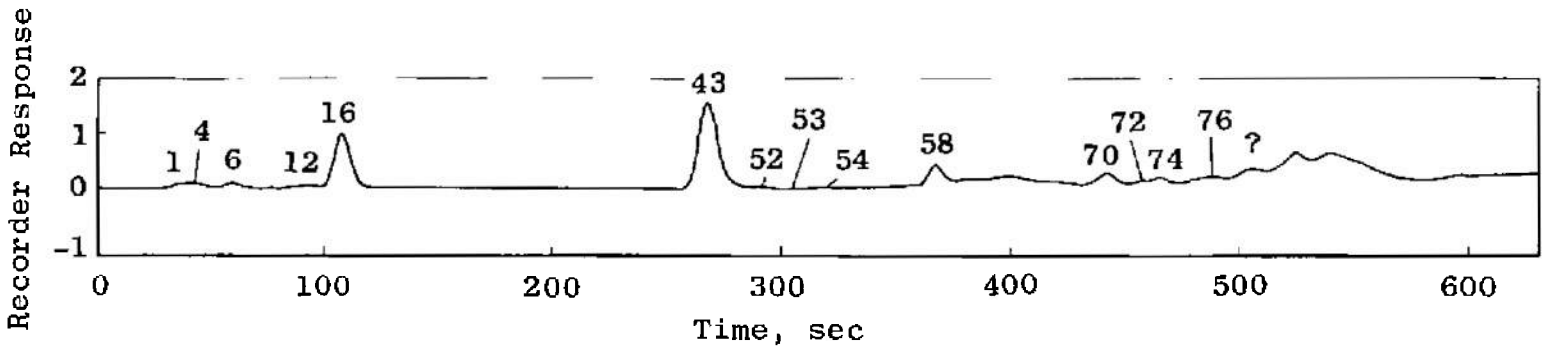


Fig. 19 Chromatogram, Set 34, –78°C; 1 cc Gas, Model 810

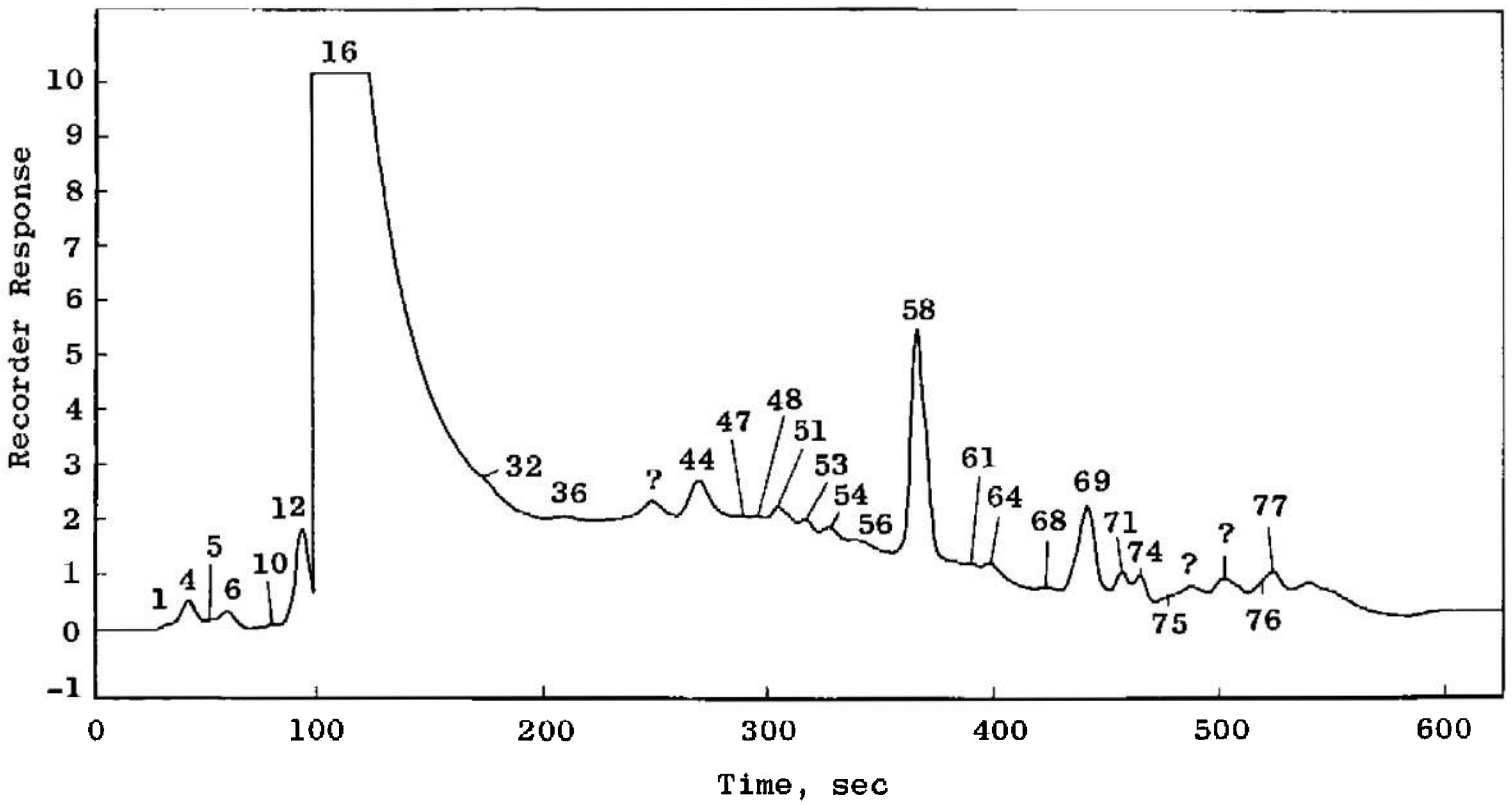


Fig. 20 Chromatogram, Set 34, -175°C; 1 cc Gas, Model 810

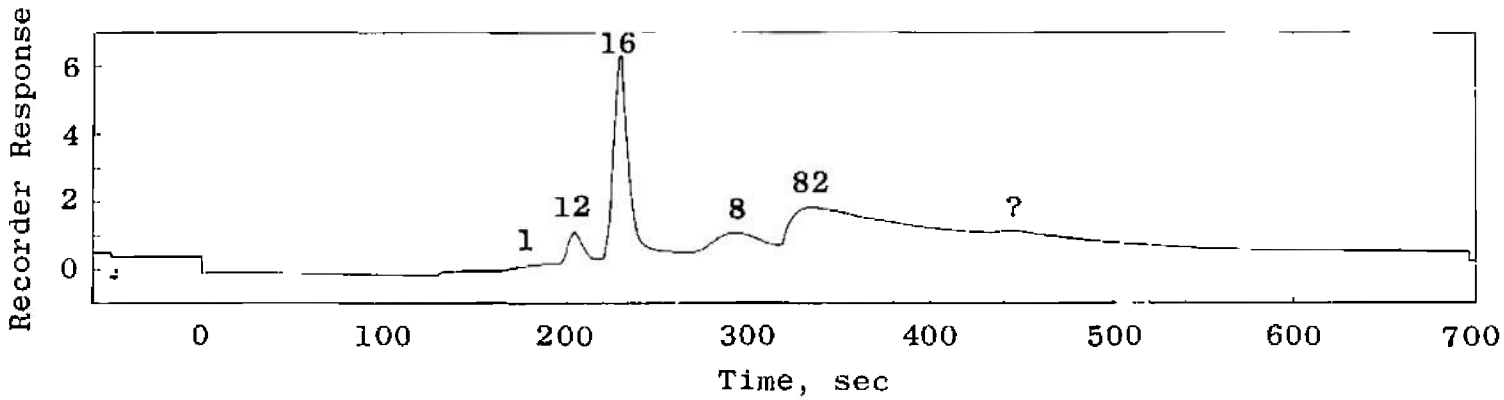


Fig. 21 Chromatogram, Set 34, 0°C; 2 $\mu\ell$ Liquid, Model 720

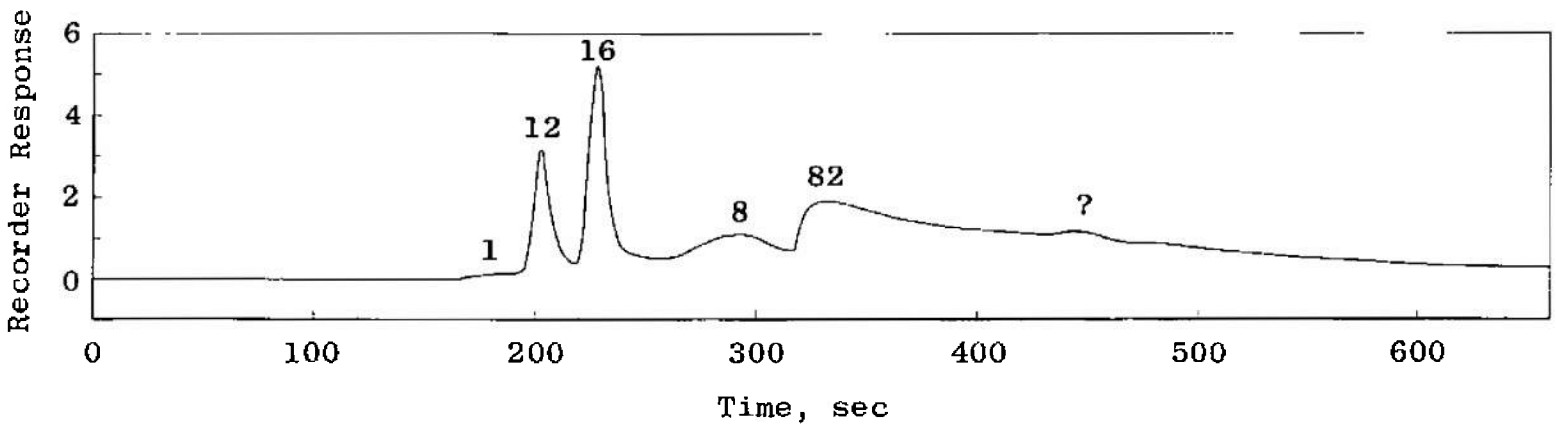


Fig. 22 Chromatogram, Set 34, –78°C; 2 $\mu\ell$ Liquid, Model 720

TABLE I
F & M MODEL 810 INSTRUMENT CONDITIONS

Carrier Gas (He) Flow Rate - Column A	15.7 mℓ/min.
Carrier Gas (He) Flow Rate - Column B	12.0 mℓ/min.
H_2 Flow Rate	63 mℓ/min.
Air Flow Rate	440 mℓ/min.
Column Temperature	
Start	30°C
End	150°C
Program Rate	20°C/min.
Detector Temperatures	255°C
Injection Port Temperature	268°C
Electrometer Range	10
Attenuation	8
Mode of Operation	Automatic
Post Injection Interval	2 min.
Upper Limit Interval	2 min.
Chart Speed	2 in./min.
Optimum Sample Size	1 cc gas 2 μℓ liquid

TABLE II
F & M MODEL 720 INSTRUMENT CONDITIONS

FLAME MODE

Carrier Gas (He) Flow Rate	130 cc/min.
H_2 Flow Rate	40 cc/min.
Air Flow Rate	280 cc/min.
Column Temperature	120°C, isothermal
Detector Temperature	123°C
Injection Port Temperature	138°C
Electrometer Range	100
Attenuation	1
Chart Speed	3 in./min.
Optimum Sample Size	2 $\mu\ell$ liquid

THERMAL CONDUCTIVITY MODE

Carrier Gas (He) Flow Rate	30 cc/min.
Bridge Current	150 ma
Column Temperature	35°C, isothermal
Detector Temperature	122°C
Injection Port Temperature	50°C
Chart Speed	3 in./min.
Optimum Sample Size	1 cc gas

TABLE III
MODEL CRS-11HSB DIGITAL READOUT CONDITIONS

Mode of Operation	Automatic
Range	Automatic (500 mv max)
Trip Level	4
Slope Sensitivity	3
Filter Frequency	3 cps
Tracking Rate - Up	1 μv/sec
Tracking Rate - Down	3 μv/sec
Threshold Level	Off
Resolution	1 count/μv-sec

TABLE IV

RETENTION AND SENSITIVITY DATA, MODEL 810

	Compound	Time, sec	Sensitivity, mg/count x 10^9	Boiling Point, °C
1.	Methane	34	54.2	-161.5
2.	Ethylene	35	114.6	-103.7
3.	Ethane	37	115.3	-88.6
4.	Propane	43	94.9	-42.1
5.	Vinyl Chloride	53	212.5	-13.9
6.	Butane	59	99.16	-0.5
7.	Acetaldehyde	81	275.0	20.2
8.	Methanol	81	260.0	64.5
9.	"Freon" MF	88	2,000.0	74.8
10.	Ethanol	92	145.0	78.4
11.	n-Pentane	97	64.3	36.1
12.	Acetone	97	134.5	56.1
13.	Isoprene	98	99.6	34.1
14.	2-Pentene	99	109.5	36-37
15.	Diethyl Ether	106	97.0	34.5
16.	Isopropanol	106	93.0	82.4
17.	2-Methyl-2-butene	108	63.5	38.6
18.	1,1-Dichloroethylene	112	255.0	31.7
19.	Methylene Chloride	114	469.0	40.1
20.	Methyl Acetate	120	202.8	56.9-57.5
21.	2,2-Dimethylbutane	121	61.7	49.7
22.	"Freon" TF	123	495.8	117.6
23.	Cyclopentene	136	60.7	44.2
24.	4-Methyl-2-pentene	145	106.9	55
25.	2,3-Dimethylbutane	146	101.0	58.0
26.	Cyclopentane	147	157.1	49.3
27.	4-Methyl-1-pentene	148	91.9	53.9
28.	2-Methylpentane	148	109.2	60.3
29.	1,1-Dichloroethane	156	248.4	57.3
30.	3-Methylpentane	168	99.7	63.3
31.	2-Methyl-1-pentene	172	150.2	62.1
32.	1-Hexene	172	100.8	63.5
33.	2-Ethyl-1-butene	184	132.0 (est.)	64.7
34.	Methyl Ethyl Ketone	186	132.5	79.6
35.	n-Hexane	187	132.0	68.7
36.	Chloroform	202	300.0	61.2
37.	2-Hexene	203	302.0	68.0
38.	Methylcyclopentane	224	128.2	71.8
39.	2,4-Dimethylpentane	227	100.9	80.5
40.	Tetrahydrofuran	236	121.0	66.0
41.	Ethylene Dichloride	236	266.0	83.6
42.	Benzene	262	109.0	80.1
43.	Cyclohexane	263	107.0	80.7
44.	Carbon Tetrachloride	268	526.0	76.8
45.	2-3-Dimethylpentane	279	118.9	89.8
46.	Cyclohexene	280	117.1	83.0
47.	3-Methylhexane	283	139.9	91.9
48.	1-Heptene	293	118.5	93.6
49.	2,2,4-Trimethylpentane	295	49.6	99.2
50.	Trichloroethylene	300	193.6	87.0
51.	3-Heptene	303	149.6	95.7
52.	Heptane	306	62.6	98.4
53.	2,4,4-Trimethyl-1-pentene	317	137.8	101.4
54.	Methylcyclohexane	326	115.4	100.1

TABLE IV (Concluded)

	Compound	Time, sec	Sensitivity, $mg/count \times 10^9$	Boiling Point, °C
55.	4-Methylcyclohexene	332	106.7	102.2
56.	2,4,4-Trimethyl-2-pentene	332	114.7	104.9
57.	2,3,4-Trimethylpentane	353	103.4	113.5
58.	Toluene	361	82.0	110.6
59.	2,2,5-Trimethylhexane	380	104.5	124.1
60.	1-Octene	381	105.5	121.3
61.	1-trans-2-Dimethylcyclohexane	390	71.1	123.4
62.	2,4-Pentanedione	390	86.1 (est.)	140.5
63.	n-Octane	392	94.0	125.7
64.	Perchloroethylene	398	658.0	121.0
65.	2-Octene	400	198.3	125.6
66.	1-cis-2-Dimethylcyclohexane	414	107.7	129.7
67.	Ethylcyclohexane	416	101.5	131.8
68.	Ethylbenzene	431	104.1	136.1
69.	p-Xylene	436	108.0	138.3
70.	m-Xylene	439	49.3	139.1
71.	o-Xylene	453	74.0	144.4
72.	2-Hexanol	455	210.5 (est.)	157.2
73.	n-Nonane	461	105.1	150.4
74.	Isopropylbenzene	470	101.3	152.4
75.	1,3,5-Trimethylbenzene	486	94.6	164.7
76.	tert-Butylbenzene	512	91.8	169.1
77.	Cyclohexanol	523	202.4 (est.)	160.9
78.	n-Decane	523	84.1	174.0
79.	sec-Butylbenzene	527	90.9	173.3
80.	p-Cymene	531	96.8	176.0
81.	n-Butylbenzene	554	41.3	183.3
82.	Water			

TABLE V
RETENTION AND SENSITIVITY DATA, MODEL 720

	Compound	Retention Time, sec	Sensitivity, mg/count x 10^9	Boiling Point, °C
1.	Acetaldehyde	145	23.5	20.2
2.	Diethyl Ether	173	64.5	34.5
3.	Methyl Acetate	203	57.3	56.9-57.5
4.	Acetone	203	24.4	56.1
5.	Isopropanol	227	23.1	82.4
6.	Ethanol	245	32.2	78.4
7.	Methyl Ethyl Ketone	246	51.5	79.6
8.	Chloroform	279	57.5	61.2
9.	Methanol	299	18.6	64.5
10.	Benzene	300	Not Calculated	80.1
11.	Perchloroethylene	359	23.2	121.0
12.	Toluene	392	Not Calculated	110.6
13.	Ethylene Dichloride	395	Not Calculated	83.6
14.	o-Xylene	665	13.8	144.4
15.	Water			

TABLE VI
QUANTITATIVE CALIBRATION

I. F & M 810

A. Gas Phase - 1-cc Mixture Injected

Component	Concn., mg/mℓ	Integrator Counts	Response, mg/count x 10^9	Average Deviation of Response, % ±	Retention Time, sec
*(14) 2-Pentene	0.000218	1,991	109.5	1.25	99
(28) 2-Methylpentane	0.000221	2,023	109.2	1.88	148
(35) Hexane	0.000221	1,662	136.6	0.75	187
(56) 2,4,4-Trimethyl-2-Pentene	0.000227	1,979	114.7	1.06	332
(59) 2,2,5-Trimethylhexane	0.000212	2,028	104.5	0.62	380
(66) 1-cis-2-Dimethylcyclohexane	0.000209	1,941	107.7	0.70	414
(69) p-Xylene	0.000221	2,047	108.0	0.10	436
(76) tert-Butylbenzene	0.000218	2,375	91.8	6.44	512

B. Liquid Phase - 2-μℓ Mixture Injected

Component	Concn., mg/μℓ	Integrator Counts	Response, mg/count x 10^9	*Average Deviation of Response, % ±	Retention Time, sec
*(12) Acetone	0.0001	1,487	134.5	3.06	97
(20) Methyl Acetate	0.0001	986	202.8	1.51	120
(34) Methyl Ethyl Ketone	0.0001	1,509	132.8	3.19	186
(36) Chloroform	0.0001	87	2300	Not Calculated	202
(64) Perchloroethylene	0.0001	304	658	1.31	398
(71) o-Xylene	0.0001	2,714	74.0	2.66	453

*Numbers in parenthesis refer to listings in Table IV.

II. F & M 720

A. Liquid Phase - 2-μℓ Mixture Injected

Component	Concn., mg/μℓ	Integrator Counts	Response, mg/count x 10^9	Deviation of Response, % ±	Retention Time, sec
†1 Acetaldehyde	0.0001	8,506	23.5	Not Calculated	147
2 Diethyl Ether	0.0001	3,100	64.5		174
3 Methyl Acetate	0.0001	3,491	57.3		204
4 Acetone	0.0001	8,188	24.4		204
5 Isopropyl Alcohol	0.0001	8,655	23.1		229
6 Ethanol	0.0001	6,205	32.2		247
7 Methyl Ethyl Ketone	0.0001	3,883	51.5		247
8 Chloroform	0.0001	3,479	57.5		279
9 Methanol	0.0001	10,780	18.6		288
10 Benzene	0.0001	Not Obtained	Not Calculated		289
11 Perchloroethylene	0.0001	8,603	23.2		364
12 Toluene	0.0001	Not Obtained	Not Calculated		391
13 Ethylene Dichloride	0.0001	Not Obtained	Not Calculated		391
14 o-Xylene	0.0001	14,506	13.8		664

Note: Overlapping Peaks in Some Cases Resolved with Data from Other 720 Chromatograms.

†Component numbers refer to listings in Table V.

TABLE VII-1
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-14-66

Date Sample Received 3-16-66 Date of Analysis 3-16-66

Sample No. 66-2-3-14-1AA Sample Set 1

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.0002				0055	.0057
2.	Ethylene							
3.	Ethane							
4.	Propane						0069	0069
5.	Vinyl Chloride						0372	0372
6.	Butane						< 0001	< 0001
7.	Acetaldehyde							
8.	Methanol							
9.	"Freon" MF							
10.	Ethanol							
11.	n-Pentane							
12.	Acetone						0002	.0002
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	3070		0439			< 0001	.3510
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene						< 0001	< 0001
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane							
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane						<.0001	<.0001
36.	Chloroform							
37	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride							
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene						.0098	.0098
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene						<.0001	<.0001
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene	.0147					<.00001	.0147
71.	o-Xylene							
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	515.3		838.2		Trace		1353.5
	CO_2		13.9		333.4		5.3	352.6
	Total gas trapped at s.t.p.(cc)		7.28		161.9		2.4	171.58

Remarks:

TABLE VII-2
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-15-66

Date Sample Received 3-17-66 Date of Analysis 3-18-66

Sample No. 66-2-3-15-2BA Sample Set 15

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.003		.0007		0029	.0066
2.	Ethylene							
3.	Ethane							
4.	Propane						.064	.064
5.	Vinyl Chloride						.035	.035
6.	Butane				<.00001		.011	.011
7.	Acetaldehyde							
8.	Methanol	.0107		0453		.0778		1338
9.	"Freon" MF							
10.	Ethanol							
11.	n-Pentane							
12.	Acetone	00107		00440		.1387	.0372	.17937
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether					.0109	.0077	.0186
16.	Isopropanol	.0119		.0286		.9683	.1814	1.1902
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane						<.0001	<.0001
30.	3-Methylpentane					00168		.00168
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone					02680	<.00001	.02680
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					.0131		.0131
42.	Benzene					<.00001	.0108	.0108
43.	Cyclohexane							
44.	Carbon Tetrachloride						.032	.032
45.	2,3-Dimethylpentane							
46.	Cyclohexene					.025		.025
47.	3-Methylhexane	.0043		.0425				.0468

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane						.004	.004
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane					.00073	.002	.00273
53.	2,4,4-Trimethyl-1-pentene						.00528	.00528
54.	Methylcyclohexane						.0004	.0004
55.	4-Methylcyclohexene							
56.	2,5,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane						<.0001	<.0001
58.	Toluene					.000013	.0162	.01621
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane					.000013	<.00001	.000013
64.	Perchloroethylene					<.00001	.005	.005
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene						<.00001	<.00001
69.	p-Xylene						.0011	.0011
70.	m-Xylene							
71.	o-Xylene					.000093	.0002	.000293
72.	2-Hexanol					.00046	.0006	.00106
73.	n-Nonane					.00073	.0009	.00163
74.	Isopropylbenzene					.0021	.0008	.0029
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene					.00047		.00047
82.	Water	166.8		929.2		40.6		1136.6
	CO_2		.307		24.4		5.42	30.127
	Total gas trapped at s.t.p.(cc)		0.9		11.6		3.8	16.3

Remarks: Unidentified Peaks:

R_t 588, -175 gas, trace peak

R_t 178, -175 gas and R_t 174, -175 liquid are probably the same

R_t 342, -175 liquid and R_t 341, -175 gas are probably the same

TABLE VII-3
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-16-66

Date Sample Received 3-18-66 Date of Analysis 3-18-66

Sample No. 66-2-3-16-2AA Sample Set 35

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		0057		0023		.0021	.0101
2.	Ethylene							
3.	Ethane							
4.	Propane						.011	.011
5.	Vinyl Chloride						016	.016
6.	Butane						.006	.006
7.	Acetaldehyde							
8.	Methanol					.2249		.2249
9.	"Freon" MF							
10.	Ethanol							
11.	n-Pentane							
12.	Acetone	00326		.0079		.2500	03300	.29416
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	01053		.0371		5.981	.00740	6.03603
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					<.0001	<.0001	<.0002
30.	3-Methylpentane					< 0001		<.0001
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone					.0253	.0206	.0459
35.	n-Hexane							
36.	Chloroform						<.0001	<.0001
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					.0352		.0352
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride						< 0001	<.0001
45.	2,3-Dimethylpentane					.0353	.001	.0363
46.	Cyclohexene							
47.	3-Methylhexane	.0007		.006				.0067

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane						.0002	.00020
50.	Trichloroethylene					<.0001		<.0001
51.	3-Heptene							
52.	Heptane					.0005	.0003	.0008
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane						<.00001	<.00001
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene				<.00001	.00013	.0092	.00933
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane					.00013		.00013
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene					.00053	<.00001	.00053
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene					.000003	.0003	.000303
71.	o-Xylene				.00147	.00008	.0002	.00175
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene				.0020	.00027	.0046	.00687
75.	1,3,5-Trimethylbenzene						.0004	.0004
76.	tert-Butylbenzene					.00027	.0147	.01497
77.	Cyclohexanol							
78.	n-Decane				.016			.016
79.	sec-Butylbenzene							
80.	p-Cymene				.065		<.00001	.065
81.	n-Butylbenzene							
82.	Water	152.0		912.6		30.7		1095.3
	CO_2		0.296		246.1		105.2	351.596
	Total gas trapped at s.t.p.(cc)		1.2		136.2		52.6	190.0

Remarks: Unidentified Peaks:

R_t 212, -175 liquid, small integrated peak

R_t 129, -175 gas, large integrated peak

R_t 252, -175 liquid, small integrated peak

R_t 338, -175 gas, and R_t 341, -175 liquid are probably the same

TABLE VII-4
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-17-66

Date Sample Received 3-19-66 Date of Analysis 3-20-66

Sample No. 66-2-3-17-1BA Sample Set 25

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		0033		0012		0008	.0053
2.	Ethylene							
3.	Ethane							
4.	Propane						0005	.0005
5.	Vinyl Chloride						0013	.0013
6.	Butane						.0007	.0007
7.	Acetaldehyde							
8.	Methanol	0055		0353		.0218		0626
9.	"Freon" MF							
10.	Ethanol					0213	.0036	.0249
11.	n-Pentane							
12.	Acetone	.00253		0111		.0717		.08863
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	01667		0335		1920	.0004	.24257
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane							
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene					00147		.00147
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride			7180				.7180
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane					.0021		.0021

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene						.0006	.0006
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene	.0002					.00009	.00029
71.	o-Xylene							
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	295.2		1350.8		Trace		1646.0
	CO_2		129		1.38		55.8	57.309
	Total gas trapped at s.t.p.(cc)		0.67		1.05		37.0	38.92

Remarks:

TABLE VII-5
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-18-66

Date Sample Received 3-20-66 Date of Analysis 3-20-66

Sample No. 66-2-3-18-1AA Sample Set 16

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1	Methane		0029		.0002			.0031
2.	Ethylene							
3.	Etaane				0010			.0010
4.	Propane							
5.	Vinyl Chloride							
6.	Butane							
7.	Acetaldehyde							
8.	Methanol	0039		.0308		0282		.0629
9.	"Freon" MF							
10.	Ethanol	0015				.0332		.0367
11	n-Pentane							
12.	Acetone	.0013		.0167	<.00001	1300	< 00001	.1480
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0099		2422		.1856		.4377
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					0121		.0121
30.	3-Methylpentane					.00222		.00222
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane					.00033		.00033
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					0008		.0008
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride	.0045		.0987		.0384		.1416
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Metnylcyclonexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene					.00011	<.00001	.00011
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene	.00012						.00012
71.	o-Xylene					<.00001		<.00001
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene					.0002		.0002
75.	1,3,5-Trimethylbenzene					.00007		.00007
76.	tert-Butylbenzene							
77.	Cyclohexanol					.0032		.0032
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	154.1		1632.3		109.1		1895.5
	CO_2		0.186		1.50		131.8	133.486
	Total gas trapped at s.t.p.(cc)		1.1		1.5		111.8	114.4

Remarks: Unidentified Peaks·

R_t 341, -175 liquid, small integrated peak

R_t 541, -175 liquid, small integrated peak

TABLE VII-6
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-19-66

Date Sample Received 3-21-66 Date of Analysis 3-21-66

Sample No. 66-2-3-19-2AA Sample Set 11

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane						<.00001	<.00001
2.	Ethylene							
3.	Ethane						.0021	.0021
4.	Propane				0074		0243	.0317
5.	Vinyl Chloride						0206	0206
6.	Butane						0097	0097
7.	Acetaldehyde							
8.	Methanol			0333		.0295		.0628
9.	"Freon" MF							
10.	Ethanol			0039		.0505		.0544
11.	n-Pentane							
12.	Acetone			.0191		.1984	.0344	.2519
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol			.0612		5554	.0046	.6212
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane					<.00001		<.00001
27.	4-Methyl-1-pentene							
28.	2-Methylpentane						.0007	.0007
29.	1,1-Dichloroethane					<.00001		<.00001
30.	3-Methylpentane					.0114	.0005	.0119
31.	2-Methyl-1-pentene					.0005	.0076	.0081
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone						.0072	0072
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane					0073	0080	.0153
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					<.00001		<.00001
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride			.1519		.1069	.0016	.2604
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane					<.00001	.0002	.0002

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane						.0022	.0022
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane					.00003	.0049	.00493
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene					.0005	.0065	.0070
57.	2,3,4-Trimethylpentane							
58.	Toluene						<.00001	<.00001
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene						<.00001	<.00001
65.	2-Octene						.0017	.0017
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene							
71.	o-Xylene						.0024	.0024
72.	2-Hexanol							
73.	n-Nonane				.0009			.0009
74.	Isopropylbenzene				<.00001		.0015	.0015
75.	1,3,5-Trimethylbenzene					.0001		.0001
76.	tert-Butylbenzene					<.00001	<.00001	<.00002
77.	Cyclohexanol							
78.	n-Decane				< 00001			<.00001
79.	sec-Butylbenzene							
80.	p-Cymene			<.00001	.0139	.0014	<.00001	.0153
81.	n-Butylbenzene			.0045		.0002		.0047
82.	Water	None Visible		1158.3		73.8		1232.0
	CO_2		3.6		153.4		.94	157.94
	Total gas trapped at s.t.p.(cc)		1.3		122.0		1.5	124.8

Remarks: Unidentified Peaks:

R_t 494, -78 gas, small integrated peak
R_t 562, -78 gas, small integrated peak
R_t 576, -78 liquid and R_t 581, -78 gas are probably the same
R_t 192, -175 liquid, trace peak
R_t 256, -175 gas, small integrated peak
R_t 369, -175 gas, large integrated peak
R_t 376, -175 liquid, small integrated peak
R_t 476, -175 gas, small integrated peak
R_t 572, -175 liquid, small integrated peak

TABLE VII-7
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-20-66

Date Sample Received 3-22-66 Date of Analysis 3-22-66

Sample No 66-2-3-20-2AA Sample Set 13

Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1. Methane		.0005		.0016		.0045	.0066
2. Ethylene							
3. Ethane					.00002		00002
4. Propane						.0029	.0029
5. Vinyl Chloride						.0033	.0033
6. Butane							
7. Acetaldehyde							
8. Methanol			.0579				.0579
9. "Freon" MF							
10. Ethanol							
11. n-Pentane							
12. Acetone			0128		.2924	.0682	.3734
13. Isoprene							
14. 2-Pentene							
15. Diethyl Ether							
16. Isopropanol			0344		.7808	.0074	.8226
17. 2-Methyl-2-butene							
18. 1,1-Dichloroethylene						.0015	.0015
19. Methylene Chloride							
20. Methyl Acetate							
21. 2,2-Dimethylbutane							
22. "Freon" TF							
23. Cyclopentene							
24. 4-Methyl-2-pentene							
25. 2,3-Dimethylbutane							
26. Cyclopentane							
27. 4-Methyl-1-pentene							
28. 2-Methylpentane							
29. 1,1-Dichloroethane					.0051		.0051
30. 3-Methylpentane					.0034		.0034
31. 2-Methyl-1-pentene							
32. 1-Hexene							
33. 2-Ethyl-1-butene						.0156	.0156
34. Methyl Ethyl Ketone					.0115	<.00001	.01151
35. n-Hexane							
36. Chloroform						.5174	5174
37. 2-Hexene							
38. Methylcyclopentane							
39. 2,4-Dimethylpentane							
40. Tetrahydrofuran							
41. Ethylene Dichloride					.0064		.0064
42. Benzene							
43. Cyclohexane							
44. Carbon Tetrachloride					.2340	.0393	.2733
45. 2,3-Dimethylpentane			.0302			<.00001	.03021
46. Cyclohexene							
47. 3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene					<.00001	<.00001	< 00002
49.	2,2,4-Trimethylpentone			.0021				.0021
50.	Trichloroethylene							
51.	3-Heptene					.0017	.0050	.0067
52.	Heptane						.0027	.0027
53.	2,4,1-Trimethyl-1-pentene				.0004			.0004
54.	Methylcyclohexane						.0033	.0033
55.	4-Methylcyclonexene							
56.	2,4,4-Trimethyl-2-pentene					.0010	.0024	.0034
57.	2,3,4-Trimethylpentane							
58.	Toluene					.0005	.0162	.0167
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione						<.00001	<.00001
63.	n-Octane							
64.	Perchloroethylene						.0218	.0218
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane						<.00001	<.00001
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene						.0011	.0011
71.	o-Xylene						.00003	.00003
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene						.0002	.0002
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene					.0005	.0004	.0009
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene						<.00001	<.00001
82.	Water	None Visible		1253.6		77.1		1330.7
	CO_2		0.05		24.7		148.2	172.95
	Total gas trapped at s.t.p.(cc)		0.9		12.5		69.0	82.4

Remarks: Unidentified Peaks:

R_t 247, -175 liquid, small integrated peak

R_t 503, -175 gas, small integrated peak

R_t 374, -175 liquid, trace peak

R_t 590, -175 liquid, trace peak

TABLE VII-8
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-21-66

Date Sample Received 3-23-66 Date of Analysis 3-23-66

Sample No 66-2-3-21-1BA Sample Set 36

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		0024		.0007			.0031
2.	Ethylene							
3.	Ethane							
4.	Propane				.0008			0008
5.	Vinyl Chloride							
6.	Butane				.0002			.0002
7.	Acetaldehyde							
8.	Methanol	.0046		0230				.0276
9.	"Freon" MF							
10.	Ethanol							
11.	n-Pentane							
12.	Acetone	.0024	.0006	0210				.0240
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	.0132	<.00001	0831				.09631
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane							
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride			.00009				.00009
45.	2,3-Dimethylpentane							
46.	Cyclohexene	.0016		.0286				.0302
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene				.0012			.0012
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene				.0007			.0007
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene							
71.	o-Xylene	.00009		.0003				.00039
72.	2-Hexanol	<.00001						<.00001
73.	n-Nonane							
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	127.3		1221.9		None		1349.2
	CO_2		0.18		0.77		None	0.93
	Total gas trapped at s.t.p.(cc)		2.3		1.0		None	3.3

Remarks:

No sample for -175°C.

TABLE VII-9
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-22-66

Date Sample Received 3-24-66 Date of Analysis 3-24-66

Sample No. 66-2-3-22-1AA Sample Set 34

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		0009		.0002		0022	.0033
2.	Etaylene							
3.	Ethane							
4.	Propane		< 00001		.0002		0215	.02171
5.	Vinyl Chloride						.0107	.0107
6.	Butane				.0003		0118	0121
7.	Acetaldehyde							
8.	Methanol	0210		0495				.0705
9.	"Freon" MF							
10.	Ethanol						0016	.0016
11.	n-Pentane							
12.	Acetone	.0260		0600	.0002		.1038	1900
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	.1120	<.00001	0976	0042		1.3680	1.58181
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane							
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene						<.00001	<.00001
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Etnylene Dichloride							
42.	Benzene			0017				.0017
43.	Cyclohexane				0099			.0099
44.	Carbon Tetrachloride						.1983	.1983
45.	2,3-Dimethylpentane	0040		.0106				.0146
46.	Cyclohexene							
47.	3-Methylhexane						<.00001	<.00001

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene			<.00001			<.00001	<.00002
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene						.0100	.0100
52.	Heptane			<.00001				<.00001
53.	2,4,4-Trimethyl-1-pentene			<.00001				<.00001
54.	Methylcyclohexane			<.00001			<.00001	<.00002
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene						<.00001	<.00001
57.	2,3,4-Trimethylpentane							
58.	Toluene				.0015		.1290	.1305
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane						<.00001	<.00001
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene						.0256	.0256
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene						<.00001	<.00001
69.	p-Xylene							
70.	m-Xylene				.0005		.0285	.0290
71.	o-Xylene				.00003		.0044	.00443
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene				.0003		.0033	.0036
75.	1,3,5-Trimethylbenzene						<.00001	<.00001
76.	tert-Butylbenzene				.0001		<.00001	.00011
77.	Cyclohexanol							
78.	n-Decane						.0332	.0332
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	1135.7		1148.0		None		2283.7
	CO_2		0.0007		0.10		1002.7	1002.8007
	Total gas trapped at s.t.p.(cc)		1.0		53.3		557.7	612.0

Remarks: Unidentified Peaks

R_t 505, -78 liquid and R_t 504, -78 gas, probably the same

R_t 487, -175 gas small integrated peak

R_t 207, -175 gas, small integrated peak

R_t 502, -175 gas, small integrated peak

TABLE VII-10
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-23-66

Date Sample Received 3-25-66 Date of Analysis 3-25-66

Sample No. 66-2-3-23-2BA Sample Set 32

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane				.0003	.00002		.00032
2.	Ethylene							
3.	Ethane							
4.	Propane							
5.	Vinyl Chloride							
6.	Butane							
7.	Acetaldehyde							
8.	Methanol					.0071		.0071
9.	"Freon" MF							
10.	Ethanol							
11.	n-Pentane							
12.	Acetone	.0373		0471	.0024	.8700		.9568
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0547		1811	.0044	.4964		.7366
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane				00036	.0051		00546
30.	3-Methylpentane							
31.	2-Methyl-1-pentene					.11276		.11276
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform					.0133		.0133
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride			.0371	.0043			.0414
45.	2,3-Dimethylpentane							
46.	Cyclohexene	.0004						0004
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene				.0037			.0037
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane				00284			00284
55.	4-Methylcyclohexene							
56.	2, ,4-Trimethyl-2-pentene				.00215			.00215
57.	2,3,4-Trimethylpentane							
58.	Toluene							
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane				01186			.01186
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane				01895			.01895
67.	Ethylcyclohexane				.01237			.01237
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene							
71.	o-Xylene							
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	1222.7		1510.4		110.8		2843.9
	CO_2		Lost		132 8		675 3	808 1
	Total gas trapped at s.t.p.(cc)		Lost		71.8		508 3	580.1

Remarks: Unidentified Peaks

R_t 194, -78 gas, trace peak

R_t 342, -78 gas, small integrated peak

R_t 371, -78 gas, trace peak

R_t 162, -175 liquid, small integrated peak

Gas sample for -175°C was lost.

TABLE VII-11
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-24-66

Date Sample Received 3-24-66 Date of Analysis 3-26-66

Sample No. 66-2-3-24-2AA Sample Set 7

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00096		.00036		.0038	.00512
2.	Ethylene							
3	Ethane							
4.	Propane		0007		0006		.0475	0488
5.	Vinyl Chloride						0298	.0298
6.	Butane		<.00001		< 00001		.0496	.04962
7.	Acetaldehyde							
8.	Methanol					.0600		.0600
9.	"Freon" MF							
10.	Ethanol	.0185				2969	.4418	7572
11.	n-Pentane							
12.	Acetone	0240	0058	0165	.0058	3 2611	3.1628	6.4760
13	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	.0276	00192	.0893	.0028	5124	.1216	.75562
17.	2-Methyl-2-butene							
18.	1,1-Dicloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Metnyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					<.00001		<.00001
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Etnyl Ketone							
35.	n-Hexane							
36.	Chloroform					.0006	<.00001	.0006
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride	.00893		< 00001		2355	< 00001	.24443
42.	Benzene							
43.	Cyclohexane						.2956	2956
44.	Carbon Tetrachloride	0078		.0177				0255
45.	2,3-Dimethylpentane							
46.	Cyclohexene					0009		.0009
47.	3-Methylhexane					.0112	.2753	.2865

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene						< 00001	<.00001
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene					.0009		.0009
54.	Methylcyclohexane						<.00001	< 00001
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene						< 00001	<.00001
57.	2,3,4-Trimethylpentane							
58.	Toluene				.00014	.0005	.0864	.08704
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane						<.00001	<.00001
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene				.0106		.0170	.0276
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene						<.00001	<.00001
69.	p-Xylene							
70.	m-Xylene				.0006		.0329	.0335
71.	o-Xylene				.00024		.0116	.01184
72.	2-Hexanol							
73.	n-Nonane			<.00001	.0007		.0170	.01771
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene				.0004		.0201	.0205
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane						.0425	.0425
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	705.1		1132.8		592.8		2430.7
	CO_2		0.61		222.2		854 5	1077.31
	Total gas trapped at s.t.p.(cc)		1.0		130.8		498.9	630.7

Remarks: Unidentified Peaks

R_t 342, -175 liquid, small integrated peak

R_t 504, -175 gas, small integrated peak

R_t 540, -175 gas, large integrated peak

TABLE VII-12
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-25-66

Date Sample Received 3-27-66 Date of Analysis 3-27-66

Sample No. 66-2-3-25-1BA Sample Set 26

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.0004		.0005		.0074	.0083
2.	Ethylene							
3.	Ethane							
4.	Propane		0003		<.00001		.2231	.2234
5.	Vinyl Chloride							
6.	Butane		<.00001		<.00001		.0522	.0522
7.	Acetaldehyde							
8.	Methanol					.0060		.0060
9.	"Freon" MF							
10.	Ethanol							
11.	n-Pentane							
12.	Acetone	.0592	.0066	.0312	0052	.3603	.5998	1.0623
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	.0675	.0013	.1245	.0030	.0991	.0470	.3424
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane							
30.	3-Methylpentane							
31.	2-Methyl-1-pentene					.0011		.0011
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					.00067		.00067
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride	<.00001		.0345		.0140		.0485
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene					.0002		.0002
57.	2,3,4-Trimethylpentane							
58.	Toluene					.00002	.0068	.00682
59.	2,2,5-Trimethylhexane					<.00001		<.00001
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane			<.00001	.0002			.0002
64.	Perchloroethylene						<.00001	<.00001
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene				.0003			.0003
69.	p-Xylene							
70.	m-Xylene					.0044	.0086	.0130
71.	o-Xylene				.00004			.00004
72.	2-Hexanol							
73.	n-Nonane			.0006		<.00001		.0006
74.	Isopropylbenzene				.0002	.0003	.0003	.0008
75.	1,3,5-Trimethylbenzene			<.00001	<.00001	<.00001	<.00001	<.00004
76.	tert-Butylbenzene			<.00001	.0010			.0010
77.	Cyclohexanol			.0109		<.00001	.0232	.0341
78.	n-Decane					.0959		.0959
79.	sec-Butylbenzene							
80.	p-Cymene				.0001			.0001
81.	n-Butylbenzene			<.00001	<.00001			<.00002
82.	Water	625.9		638.8		106.6		1371.3
	CO_2		0.8492		222.2		48.35	271.3992
	Total gas trapped at s.t.p.(cc)		0.9		4.6		288.0	293.5

Remarks: Unidentified Peaks

R_t 492, -78 gas, small integrated peak
R_t 504, -78 liquid, small integrated peak
R_t 539, -78 liquid, small integrated peak
R_t 547, -78 gas, trace peak
R_t 564, -78 liquid, trace peak
R_t 569, -78 gas, trace peak
R_t 585, -78 gas, trace peak
R_t 594, -78 liquid, small integrated peak
R_t 624, -78 gas, trace peak
R_t 165, -175 gas, large integrated peak
R_t 540, -175 liquid, trace peak
R_t 597, -175 liquid, trace peak
R_t 623, -175 gas, trace peak
R_t 572, -175 gas, trace peak
R_t 539, -175 gas, trace peak
R_t 503, -175 gas, and
R_t 504, -175 liquid, probably same

TABLE VII-13
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-26-66

Date Sample Received 3-29-66 Date of Analysis 3-29-66

Sample No. 66-2-3-26-1AA Sample Set 3

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00033		.00032		.0060	.00665
2.	Ethylene							
3.	Ethane							
4.	Propane						.0378	.0378
5.	Vinyl Chloride						<.00001	<.00001
6.	Butane	<.00001					.0056	.00561
7.	Acetaldehyde					.1166		.1166
8.	Methanol	.0016		.0035		.0928		0979
9.	"Freon" MF							
10.	Ethanol	.0221		.0081			0144	.0446
11.	n-Pentane							
12.	Acetone	.0332		.0260		9.5071	.0938	9.6601
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0267	.0003	.0727	.0003	1.9668	.0060	2.0728
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF				<.00001			<.00001
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.0105		.0105
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene					.0028		.0028
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					<.00001	<.00001	<.00002
42.	Benzene							
43.	Cyclohexane						.0082	.0082
44.	Carbon Tetrachloride	<.00001	.0005					.00051
45.	2,3-Dimethylpentane					.0849		0849
46.	Cyclohexene			0049				.0049
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene			<.00001		<.00001		<.00002
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene			<.00001			<.00001	<.00002
52.	Heptane					.0005	<.00001	.00051
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane						<.00001	<.00001
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene					.0017	<.00001	.00171
57.	2,3,4-Trimethylpentane							
58.	Toluene				<.00001	.0024	.0094	01181
59.	2,2,5-Trimethylhexane							
60.	1-Octene					.00006		.00006
61.	1-trans-2-Dimethylcyclohexane						<.00001	<.00001
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene						.0001	.0001
65.	2-Octene			.0250	.0032	.0003		.0285
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane						<.00001	<.00001
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene				.00021	.0029	.0022	.00531
71.	o-Xylene				.00008	00015	.00022	00045
72.	2-Hexanol							
73.	n-Nonane				.0002	.0150	.00002	.01522
74.	Isopropylbenzene				.00001		<.00001	.00002
75.	1,3,5-Trimethylbenzene				.0002	.0014	.000004	001604
76.	tert-Butylbenzene				< 00001			<.00001
77.	Cyclohexanol						<.00001	< 00001
78.	n-Decane			.0089	.0021	.0062	.0010	.0182
79.	sec-Butylbenzene							
80.	p-Cymene					.0666	<.00001	.06661
81.	n-Butylbenzene			<.00001	.0002	.0483		.04851
82.	Water	418 5		982 7		1775.7		3176.9
	CO_2		0.9232		67.909		97.263	166.0952
	Total gas trapped at s.t.p.(cc)		1.1		44.86		54.57	100.53

Remarks: Unidentified Peaks

R_t 591, -78 liquid, and R_t 595, -78 gas, small integrated peaks, probably same

R_t 567, -78 liquid, small integrated peak

R_t 502, -78 gas, small integrated peak

R_t 502, -175 gas, and R_t 504, -175 liquid, small integrated peaks, probably same

R_t 247, -175 gas, trace peak

R_t 595, -175 gas and R_t 596, -175 liquid, probably same

TABLE VII-14
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-27-66

Date Sample Received 3-29-66 Date of Analysis 3-29-66

Sample No. 66-2-3-27-2BA Sample Set 16

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00035		.00037		.0055	00622
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		<.00001		.4086	40862
5.	Vinyl Chloride			< 00001			.1174	11741
6.	Butane						2376	2376
7.	Acetaldehyde							
8.	Methanol	0068		11.3298		.0053		11.3419
9.	"Freon" MF							
10.	Ethanol	1035		.1276		0493	.1910	.4714
11.	n-Pentane							
12.	Acetone	0432		.9831		.5835	8930	2.5028
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0381	0004	.8426	.00062	.0660	2.3572	3.30492
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene					.0014		.0014
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane		.0025			.0077		.0102
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane					<.00001		<.00001
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride	<.00001				.0094	.0271	.03651
45.	2,3-Dimethylpentane			.0049				.0049
46.	Cyclohexene							
47.	3-Methylhexane					<.00001		<.00001

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene			.0078				0078
49.	2,2,4-Trimethylpentane					<.00001		<.00001
50.	Trichloroethylene			<.00001				<.00001
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene				<.00001		<.00001	<.00002
54.	Methylcyclohexane				<.00001		<.00001	<.00002
55.	4-Methylcyclohexene				.0050			.0050
56.	2,4,4-Trimethyl-2-pentene					0002	<.00001	.00021
57.	2,3,4-Trimethylpentane							
58.	Toluene				<.00001	< 00001	.0318	03182
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane					<.00001		<.00001
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroetnylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene			.0081	.00006		.0081	.01626
71.	o-Xylene				<.00001		.0014	.00141
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene	.0298	.0016		.00006		.0028	.03426
75.	1,3,5-Trimethylbenzene				<.00001	.0011		.00111
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene			.0133	.0008			.0141
80.	p-Cymene					.0050		0050
81.	n-Butylbenzene	.0036	.0036	<.00001				.00721
82.	Water	1045.4		1199.3		94.7		2339.4
	CO_2		0.7565		1.6705		1044.9	1047.3270
	Total gas trapped at s.t.p.(cc)		1.2		1.5		607.2	609.9

Remarks: Unidentified Peaks.

R_t 561, 0 liquid, small integrated peak
R_t 576, 0 gas small integrated peak
R_t 580, 0 liquid, trace peak
R_t 479, -78 liquid, large integrated peak
R_t 504, -78 gas, small integrated peak
R_t 508, -78 liquid, trace peak
R_t 540, -78 gas, small integrated peak
R_t 576, -78 liquid, small integrated peak
R_t 594, -78 gas, small integrated peak
R_t 248, -175 gas, trace peak
R_t 507, -175 gas, trace peak
R_t 576 -175 liquid, small integrated peak

TABLE VII-15
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-28-66

Date Sample Received 3-30-66 Date of Analysis 3-30-66

Sample No. 66-2-3-28-2AA Sample Set 12

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00048		.0005		.0007	.00168
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		<.00001		.0460	.04602
5.	Vinyl Chloride						.0290	.0290
6.	Butane		<.00001		<.00001		.0318	03182
7.	Acetaldehyde							
8.	Methanol	.0027		0048		.0036		.0111
9.	"Freon" MF							
10.	Ethanol	.0044		0140		0121	.0432	.0737
11.	n-Pentane							
12.	Acetone	0269		.0144		.4167	.0358	4938
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0136	.00056	.0256	.00074	.0348	0126	.0879
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane					.0010		0010
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.0044		.0044
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane						<.00001	<.00001
36.	Chloroform	.0277						0277
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Etnylene Dichloride			0002			<.00001	.00021
42.	Benzene	< 00001						<.00001
43.	Cyclohexane							
44.	Carbon Tetrachloride			0043		.0100	<.00001	.01431
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene		< 00001				.0055	.00551
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene						<.00001	<.00001
54.	Methylcyclohexane						<.00001	<.00001
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene					.0003	<.00001	.00031
57.	2,3,4-Trimethylpentane							
58.	Toluene				.0010	.00008	0144	.01548
59.	2,2,5-Trimethylhexane					<.00001	<.00001	<.00002
60.	1-Octene			<.00001				<.00001
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene					.0072	.0060	.0132
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene						<.00001	<.00001
69.	p-Xylene							
70.	m-Xylene				.0001	.00027	.0121	.01247
71.	o-Xylene				.0001	.00024	.0062	.00654
72.	2-Hexanol							
73.	n-Nonane				.0002	.0004	.0026	.0032
74.	Isopropylbenzene				.0022		<.00001	.00221
75.	1,3,5-Trimethylbenzene					.0003	.0059	.0062
76.	tert-Butylbenzene							
77.	Cyclohexanol			< 00001	<.00001	.0037	< 00001	.00373
78.	n-Decane	.0054	.0008	.0069	.0036	.0022	.0156	.0345
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	693.0		279 3		109.1		1081.4
	CO_2		15.956		1.965		251.7	269.621
	Total gas trapped at s.t.p.(cc)		7.5		1.7		146.7	155.9

Remarks:

TABLE VII-16
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-29-66

Date Sample Received 3-31-66 Date of Analysis 3-31-66

Sample No. 66-2-3-29-1BA Sample Set 15

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		00046		.00051		.00007	00104
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		<.00001		01335	.01337
5.	Vinyl Chloride						.00892	.00892
6.	Butane				00033		0500	.05033
7.	Acetaldehyde							
8.	Methanol	0041		.0013		.00057		.00597
9.	"Freon" MF							
10.	Ethanol	0087		.0080		.0164	.0270	.0601
11.	n-Pentane							
12	Acetone	0373		0515		.0569	5776	7233
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0139	.00032	0717	00074	.0236		.11026
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimetnylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane						< 00001	<.00001
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene					00012	< 00001	.00012
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform						<.00001	<.00001
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride						<.00001	<.00001
42.	Benzene	<.00001					<.00001	<.00002
43.	Cyclohexane							
44.	Carbon Tetrachloride							
45.	2,3-Dimethylpentane	00506	00009			00049	.01005	.01569
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane					< 00001	<.00001	< 00002
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane						00152	00152
53.	2,4,4-Trimethyl-1-pentene						<.00001	<.00001
54.	Methylcyclohexane					<.00001	< 00001	<.00002
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane						.00016	.00016
58.	Toluene						.0072	.0072
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane						<.00001	<.00001
64.	Perchloroethylene							
65.	2-Octene	0235	.00454	.0192	00224	<.00001	<.00001	04948
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene						< 00001	<.00001
69.	p-Xylene							
70.	m-Xylene				.00015		.0150	.01515
71.	o-Xylene				.00016		.00054	00070
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene				.00027	<.00001	00082	.00109
75.	1,3,5-Trimethylbenzene				.00008		<.00001	.00009
76.	tert-Butylbenzene			00180	00054	<.00001	.00085	00319
77.	Cyclohexanol	0196	.00242	<.00001	<.00001	.00083	<.00001	0228
78.	n-Decane			.0103	.00123		00085	.01238
79.	sec-Butylbenzene							
80.	p-Cymene	<.00001						< 00001
81.	n-Butylbenzene				<.00001			< 00001
82.	Water	770.7		1109.8		68 9		1949 4
	CO_2		3.378		16.087		82 478	101 943
	Total gas trapped at s.t.p.(cc)		1.1		8 6		46.0	55.7

Remarks: Unidentified Peaks

R_t 591, liquid, 0°C, small integrated peaks

R_t 371, gas, 78°C, small integrated peak, 573, gas, -78°C, small nonintegrated peak

R_t 543, gas, 543, liquid, -78°C, small integrated peaks, probably the same

R_t 345, gas, 480, gas, 572, gas, -175°C small integrated peaks

R_t 250, gas, -175°C large integrated peak

R_t 544, gas, 542, liquid, -175°C, nonintegrated peaks, probably the same

R_t 566, liquid, 572, gas, -175°C, large and small integrated peaks respectively, probably the same.

TABLE VII-17
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-30-66

Date Sample Received 4-1-66 Date of Analysis 4-1-66

Sample No. 66-2-3-30-1AA Sample Set 1

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00079		00017		.0092	.01016
2.	Ethylene							
3.	Ethane							
4.	Propane		<.00001		.00066		.3171	.31777
5.	Vinyl Chloride						.1019	.1019
6.	Butane		<.00001				.0892	.08921
7.	Acetaldehyde							
8.	Methanol	.0039		.0116		.01080	.0164	.0427
9.	"Freon" MF							
10.	Ethanol	.0185		.0267			0982	.1434
11.	n-Pentane							
12.	Acetone	0360		.0477		1.0707	2.1300	3.2844
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0164	.00028	0749	.00026		.0524	.14424
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene					<.00001		<.00001
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.0101		.0101
30.	3-Methylpentane					.0034		.0034
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane					.00017		.00017
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					.0327		.0327
42.	Benzene			0284			.2138	.2422
43.	Cyclohexane							
44.	Carbon Tetrachloride	0081				.0419	.7320	.7820
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene					.00013		.00013
52.	Heptane						< .00001	< .00001
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane					.00012	< .00001	.00012
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene					.00004	.0274	.02744
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane					.00007	< .00001	.00007
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene					<.00001	<.00001	< .00002
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene				.00016	.00013	0128	.01309
71.	o-Xylene				.00011	00009	.0048	.00503
72.	2-Hexanol							
73.	n-Nonane		<.00001	< .00001	<.00001			<.00003
74.	Isopropylbenzene					.00041	<.00001	00041
75.	1,3,5-Trimethylbenzene					.00037	< 00001	.00037
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane			0129		0013		.0142
79.	sec-Butylbenzene							
80.	p-Cymene					.00013		.00013
81.	n-Butylbenzene					<.00001		< 00001
82.	Water	942.5		1201.6		105.2		2249.3
	CO_2		0.6953		1.971		801 6	804.2663
	Total gas trapped at s.t.p.(cc)		1.3		1.4		560.1	562.8

Remarks: Unidentified Peaks

R_t 505, -175 liquid, small integrated peak

R_t 569, -175 liquid, small integrated peak

R_t 597, -175 liquid, trace peak

R_t 636, -175 liquid, small integrated peak

TABLE VII-18
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 3-31-66

Date Sample Received 4-2-66 Date of Analysis 4-2-66

Sample No. 66-2-3-31-2BA Sample Set 20

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		00039		.00076		.0042	.00535
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		< 00001		1426	.1426
5.	Vinyl Chloride						.0946	.0946
6.	Butane		<.00001		.00020		.0693	.0695
7.	Acetaldehyde							
8.	Methanol	.0113		.0127		.0083		.0323
9.	"Freon" MF							
10.	Ethanol	0757		0529		.0365	.1726	.3377
11.	n-Pentane							
12.	Acetone	.0798		0455		.7620	1.8606	2.7479
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	.0169	.00044	0773	< 00001	.0344	1.9834	2.11244
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene			<.00001				<.00001
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.0040		.0040
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone					.0049	<.00001	.0049
35.	n-Hexane							
36.	Chloroform			0506		.0061		.0567
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride	.0053				.0185	<.00001	.0238
42.	Benzene			.0188	<.00001		.1780	.1968
43.	Cyclohexane							
44.	Carbon Tetrachloride	<.00001				.0244		.0244
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene						.1660	.1660
51.	3-Heptene			<.00001				<.00001
52.	Heptane			<.00001		<.00001	<.00001	<.00003
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane						<.00001	<.00001
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene					.00018	<.00001	.00018
57.	2,3,4-Trimethylpentane							
58.	Toluene		.0020	<.00001		.00009	.0443	.0464
59.	2,2,5-Trimethylhexane							
60.	1-Octene			<.00001				<.00001
61.	1-trans-2-Dimethylcyclohexane					.00040	.00012	.00052
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene						<.00001	<.00001
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene					<.00001		<.00001
69.	p-Xylene							
70.	m-Xylene			<.00001	.0004	.0062	.0040	.0106
71.	o-Xylene			.0015	.0010	.00088	.0128	.01618
72.	2-Hexanol							
73.	n-Nonane						.00024	.00024
74.	Isopropylbenzene	0180	.0009		.0014			.0203
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene					.0033		.0033
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene				.0233	.0052		.0285
81.	n-Butylbenzene			<.00001	.0048	.0012		.0060
82.	Water	1490.4		1266.6		87.2		2844.2
	CO_2		10 001		199 96		731.97	941.931
	Total gas trapped at s.t.p.,(cc)		0.5		118.3		562.1	680.9

Remarks: Unidentified Peaks

R_t 493, -78 gas, trace peak

R_t 505, -78 liquid, and R_t 509, -78 gas are probably same.

R_t 542, -78 liquid, large integrated peak

R_t 494, -175 liquid, small integrated peak

R_t 505, -175 gas, small integrated peak

R_t 559, -175 liquid, trace peak

R_t 577, -175 liquid, trace peak

R_t 606, -175 gas, small integrated peak

TABLE VII-19
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-1-66

Date Sample Received 4-3-66 Date of Analysis 4-3-66

Sample No. 66-2-4-1-2AA Sample Set 31

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00019		.00022		.00023	.00064
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		< 00001		.0652	.0652
5.	Vinyl Chloride						.0320	0320
6.	Butane						0335	0335
7.	Acetaldehyde							
8.	Methanol	0069		0035		0069		0173
9.	"Freon" MF							
10.	Ethanol	1556		0882		0368	0108	2914
11.	n-Pentane							
12.	Acetone	0382	0122	2264		5053	0854	8675
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	.0110	0004	2264	00044	0229	1224	.38354
17.	2-Methyl-2-butene							
18.	1,1-Dichloroetnylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene					< 00001		< .00001
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.0089		.0089
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform					< .00001	< .00001	< .00002
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene					0013		0013
43.	Cyclohexane							
44.	Carbon Tetrachloride	< 00001				< .00001	< 00001	< .00003
45.	2,3-Dimethylpentane							
46.	Cyclohexene			0059				.0059
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene			<.00001				<.00001
51.	3-Heptene							
52.	Heptane						< 00001	<.00001
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane						00011	.00011
55.	4-Methylcyclohexene					00011		.00011
56.	2, ,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane					<.00001	<.00001	<.00002
58.	Toluene				<.00001		0028	.0028
59.	2,2,5-Trimethylhexane							
60.	1-Octene					<.00001		<.00001
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane					<.00001		<.00001
64.	Perchloroethylene						.00068	00068
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene	<.00001			.00031	.00053	.0012	.00204
71.	o-Xylene				00046		00084	00130
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene	.0114	00037	.0292	.00030	.0015	<.00001	.04277
75.	1,3,5-Trimethylbenzene					.0042		.0042
76.	tert-Butylbenzene					.0071	.0611	.0682
77.	Cyclohexanol							
78.	n-Decane					.0200	.1031	.1231
79.	sec-Butylbenzene			.0921	.0103			.1024
80.	p-Cymene							
81.	n-Butylbenzene					<.00001		<.00001
82.	Water	826.1		1010.8		115.1		1952.0
	CO_2		7.706		3.007		74 41	85.123
	Total gas trapped at s.t.p.(cc)		0 5		29.0		48.76	78 26

Remarks:

TABLE VII-20
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-2-66

Date Sample Received 4-4-66 Date of Analysis 4-4-66

Sample No. 66-2-4-2-1BA Sample Set 22

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		0033		0049		.00052	.00872
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		00081		.06160	.06241
5.	Vinyl Chloride						01329	.01329
6.	Butane		< 00001		00100		.01043	01143
7.	Acetaldehyde							
8.	Methanol	.0084		0113		0033		.0230
9.	"Freon" MF							
10.	Ethanol	0096		.0386		0061	.0194	.0737
11.	n-Pentane							
12.	Acetone	.0464		1294		3916	.1881	.7555
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0136	.0002	.0544	.00014	.0135		.08184
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane							
30.	3-Methylpentane							
31.	2-Methyl-1-pentene						07471	.07471
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone					.00044		.00044
35.	n-Hexane							
36.	Chloroform			0528		0116		0644
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride			<.00001		.0024		.0024
42.	Benzene				< 00001			<.00001
43.	Cyclohexane							
44.	Carbon Tetrachloride						.00399	.00399
45.	2,3-Dimethylpentane			.00530		<.00001		.00530
46.	Cyclohexene	<.00001						<.00001
47.	3-Methylhexane					00002		.00002

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene						< 00001	<.00001
52.	Heptane		< 00001				<.00001	<.00002
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene			<.00001				<.00001
57.	2,3,4-Trimethylpentane					<.00001	<.00001	<.00002
58.	Toluene				.00085	<.00001	.0078	.00865
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane			<.00001	< 00001			<.00002
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene						.00158	00158
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene			0015	.0019	00012	.0015	.00502
71.	o-Xylene			0028	.00792		.0020	.01272
72.	2-Hexanol							
73.	n-Nonane			<.00001	00092			00092
74.	Isopropylbenzene	<.00001				00109	<.00001	00109
75.	1,3,5-Trimethylbenzene			< 00001	.00016			00016
76.	tert-Butylbenzene			0053	.00334	.00307	.00644	.01815
77.	Cyclohexanol	.02032	.00202	<.00001	.00680	< 00001	<.00001	02914
78.	n-Decane							
79.	sec-Butylbenzene			.0175		.00488	01136	03379
80.	p-Cymene						< 00001	<.00001
81.	n-Butylbenzene							
82.	Water	1234.5		1147.8		87.5		2469.8
	CO_2		5.669		205.6		253.7	464 969
	Total gas trapped at s.t.p.(cc)		1.1		120 0		133.1	254 2

Remarks: Unidentified Peaks:

R_t 504, -78 gas, small integrated peak

R_t 539, -78 gas, small integrated peak

R_t 543, -78 liquid, small integrated peak

R_t 250, -175 gas, trace peak

R_t 491, -175 liquid and R_t 493, -175 gas, small integrated peaks, probaoly same

R_t 542, -175 liquid and R_t 543, -175 gas, small integrated peaks, probably same

R_t 595, -175 liquid, large integrated peak

TABLE VII-21
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-3-66

Date Sample Received 4-5-66 Date of Analysis 4-5-66

Sample No. 66-2-4-3-1AA Sample Set 28

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		00051		.00079		00079	.00209
2.	Ethylene							
3.	Ethane							
4.	Propane		<.00001		<.00001		.0435	.0435
5.	Vinyl Chloride						.0240	0240
6.	Butane		00061		<.00001		.0207	.02131
7.	Acetaldehyde							
8.	Methanol	.0132		0028		.00041		.01641
9.	"Freon" MF							
10.	Ethanol	.0375		.0133		.0104	.0548	1160
11.	n-Pentane							
12.	Acetone	.0701		0182	0852	.4144	.2490	.8369
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0182		0109		.0120	1960	.2371
17.	2-Metnyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF				<.00001			<.00001
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.0051	<.00001	.0051
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform	< 00001					<.00001	<.00002
37.	2-Hexene							
38.	Methylcyclopentane					0025		0025
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride			.0027				.0027
42.	Benzene							
43.	Cyclohexane							
44.	Carbon Tetrachloride					.0025		0025
45.	2,3-Dimethylpentane							
46.	Cyclohexene			.00056		<.00001	< 00001	.00056
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene						< 00001	<.00001
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene						<.00001	< 00001
52.	Heptane						<.00001	<.00001
53.	2,4,4-Trimethyl-1-pentene				<.00001			<.00001
54.	Methylcyclohexane						<.00001	<.00001
55.	4-Methylcyclohexene				<.00001			<.00001
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene					< 00001	.0792	.0792
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane				.0056			0056
68.	Ethylbenzene	< 00001	<.00001	<.00001				<.00003
69.	p-Xylene							
70.	m-Xylene				.00032	< 00001	0060	.00632
71.	o-Xylene			<.00001	<.00001	< 00001	.0022	0022
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene	<.00001			0002	.00055	< 00001	00075
75.	1,3,5-Trimethylbenzene				.0025	.00077	< 00001	.00327
76.	tert-Butylbenzene			<.00001	<.00001			<.00002
77.	Cyclohexanol					<.00001		<.00001
78.	n-Decane							
79.	sec-Butylbenzene					.0058		.0058
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	1613.1		318.7		124.4		2056.2
	CO_2		315.7		127 8		1014.5	1458.0
	Total gas trapped at s.t.p.(cc)		180.6		121.0		576 4	878 0

Remarks: Unidentified Peaks·

R_t 372, 0 gas, trace peak

R_t 374, -78 gas, large integrated peak

R_t 501, -175 gas, trace peak

R_t 506, -175 liquid, trace peak

R_t 568, -175 liquid, large integrated peak

TABLE VII-22
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-4-66

Date Sample Received 4-6-66 Date of Analysis 4-6-66

Sample No. 66-2-4-4-2BA Sample Set 10

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		00048		00025		.00042	00115
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		<.00001		.0652	.0652
5.	Vinyl Chloride						< 00001	<.00001
6.	Butane		< 00001		0013		<.00001	.00132
7.	Acetaldehyde							
8.	Methanol	.0036		.0051		0075		.0162
9.	"Freon" MF							
10.	Ethanol	0316		0342		.0108		0766
11.	n-Pentane							
12.	Acetone	0257		0547		.1776	.1470	4050
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0036		.0364		0060	.0028	0488
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene					< 00001		< 00001
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					00035		00035
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone	<.00001						<.00001
35.	n-Hexane							
36.	Chloroform		.0930					.0930
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene							
43.	Cyclohexane	< 00001		0002		0003		00051
44.	Carbon Tetrachloride							
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene			.0014				.0014
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene						.4782	4782
54.	Methylcyclohexane							
55.	4-Methylcyclohexene					00009		.00009
56.	2,4,4-Trimethyl-2-pentene			<.00001				<.00001
57.	2,3,4-Trimethylpentane							
58.	Toluene						.0344	0344
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene				<.00001		.00109	00109
71.	o-Xylene			<.00001			.00076	00076
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene					<.00001	<.00001	<.00002
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	899 7		1310.2		84 3		2294 2
	CO_2		36.694		2 0886		442.24	481 0226
	Total gas trapped at s.t.p.(cc)		19.5		4.7		279.2	303 4

Remarks: Unidentified Peaks·

R_t 163, -175 liquid, small integrated peak

R_t 541, -175 liquid, small integrated peak

R_t 596, -175 liquid, small integrated peak

TABLE VII-23
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-5-66

Date Sample Received 4-7-66 Date of Analysis 4-7-66

Sample No. 66 2-4-5-2AA Sample Set 35

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		00022		.00021		00003	00046
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		< 00001		00315	.00317
5.	Vinyl Chloride						< 00001	<.00001
6.	Butane		00005		00003		< 00001	.00008
7.	Acetaldehyde							
8.	Methanol	0024		.0197		0063		.0284
9.	"Freon" MF							
10.	Ethanol	0061		0697		.0135		.0893
11.	n-Pentane							
12.	Acetone	0252		0522		.1416	.0308	2498
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol			0365		.0061	.00114	.04374
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene					<.00001		< 00001
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					<.00001		< 00001
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform					.0044		.0044
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene	<.00001		< 00001		.00033		.00033
43.	Cyclohexane							
44.	Carbon Tetrachloride						.2978	.2978
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane					<.00001		<.00001
55.	4-Methylcyclohexene						.00367	00367
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane						00026	.00026
58.	Toluene						<.00001	<.00001
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene			.0432				0432
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene			<.00001	< 00001			<.00002
69.	p-Xylene							
70.	m-Xylene					<.00001	.00014	00014
71.	o-Xylene						<.00001	< 00001
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene			.00964	.00188			.01152
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	543.0		1378 7		87.5		2009.2
	CO_2		2 333		6.352		172 94	181.625
	Total gas trapped at s.t.p.(cc)		1.0		5 7		104 5	111 2

Remarks:

TABLE VII-24
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-6-66

Date Sample Received 4-8-66 Date of Analysis 4-8-66

Sample No. 66-2-4-6-1BA Sample Set 18

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane				00034			00034
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		0015		.00078	00228
5.	Vinyl Chloride						0393	0393
6.	Butane						< 00001	< 00001
7.	Acetaldehyde							
8.	Methanol	00008		0037		0040		00778
9.	"Freon" MF							
10.	Ethanol	0195		.0229		.0092		.0516
11.	n-Pentane							
12.	Acetone	0298		0655		1570	.1395	3918
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	00089		0316	<.00001	.0057		03820
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene						<.00001	< 00001
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene					.00035		00035
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane			<.00001				< 00001
30.	3-Methylpentane					<.00001		< 00001
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform			.0108				0108
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene	< 00001						<.00001
43.	Cyclohexane							
44.	Carbon Tetrachloride					.0014		.0014
45.	2,3-Dimethylpentane							
46.	Cyclohexene			< 00001				< 00001
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane				<.00001			<.00001
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene					< 00001		< 00001
56.	2,4,4-Trimetnyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene				< 00001			< 00001
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene			< 00001		<.00001	< 00001	< 00003
69.	p-Xylene							
70.	m-Xylene							
71.	o-Xylene			< 00001	<.00001	< 00001	< 00001	<.00004
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	914.6		1134.5		59.2		2108.3
	CO_2		127.35		8 208		721.46	857 018
	Total gas trapped at s.t.p.(cc)		111 3		3.4		486.4	601.1

Remarks: Unidentified Peaks

R_t 214, -175 liquid, trace peak

TABLE VII-25
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-7-66

Date Sample Received 4-9-66 Date of Analysis 4-9-66

Sample No. 66-2-4-7-1AA Sample Set 11

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1	Methane		00015		00038		0578	05833
2.	Ethylene							
3.	Ethane							
4.	Propane		< 00001		< 00001		0664	0664
5.	Vinyl Chloride						00202	.00202
6.	Butane		.00001		00008		<.00001	00009
7.	Acetaldehyde							
8.	Methanol	0093		0043		0023		0159
9.	"Freon" MF							
10.	Ethanol	0296		0524		0213	.1504	2537
11.	n-Pentane							
12.	Acetone	0080		0437		1453	8552	1.0522
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol	0017		0204			00028	02238
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene					< 00001		< 00001
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane			<.00001		<.00001		< 00002
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform					1691		1691
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride			0527				0527
42.	Benzene							
43.	Cyclohexane	<.00001				00074		.00074
44.	Carbon Tetrachloride							
45.	2,3-Dimethylpentane			0073				.0073
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene					<.00001		<.00001
56.	2,4,4-Trimethyl-2-pentene			<.00001				<.00001
57.	2,3,4-Trimethylpentane				00079		< 00001	.00079
58.	Toluene					<.00001		< 00001
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene						< 00001	< 00001
69.	p-Xylene		<.00001					<.00001
70.	m-Xylene					<.00001	<.00001	<.00002
71.	o-Xylene	< 00001	< 00001			<.00001	<.00001	< 00004
72.	2-Hexanol							
73.	n-Nonane						<.00001	<.00001
74.	Isopropylbenzene			0227	<.00001		< 00001	0227
75.	1,3,5-Trimethylbenzene	<.00001						< 00001
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	660.2		918.5		53.5		1632 2
	CO_2		5.513		2.010		1033.7	1041.22
	Total gas trapped at s.t.p.(cc)		2.0		1 5		592 6	596.1

Remarks: Unidentified Peaks

R_t 213, 0 liquid, small integrated peak

R_t 369, -175 gas, trace peak

TABLE VII-26
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-8-66

Date Sample Received 4-11-66 Date of Analysis 4-12-66

Sample No. 66-2-4-8-2BA Sample Set 4

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		.00034		.00047		.00048	.00129
2.	Ethylene							
3.	Ethane							
4.	Propane		<.00001				.1361	.1361
5.	Vinyl Chloride						<.00001	<.00001
6.	Butane		.00004				<.00001	.00004
7.	Acetaldehyde							
8.	Methanol	.0045		.0043		.0056		.0144
9.	"Freon" MF							
10.	Ethanol	.0232		.0445		.0169		.0846
11.	n-Pentane							
12.	Acetone	.0241		.0545		.2584	.2664	.6034
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol			.0252		.0065	.0076	.0393
17.	2-Methyl-2-butene			<.00001				<.00001
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate					<.00001		<.00001
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					.00054		.00054
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone					<.00001		<.00001
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene			<.00001			<.00001	<.00002
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane	.00665						.00665
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					.0253		.0253
42.	Benzene							
43.	Cyclohexane			<.00001				<.00001
44.	Carbon Tetrachloride							
45.	2,3-Dimethylpentane	<.00001				.00048	.4141	.41458
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane						.1011	.1011
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene						≤.00001	≤.00001
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene					.00035		.00035
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene						≤.00001	≤.00001
71.	o-Xylene					.00095	.00156	.00251
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene							
75.	1,3,5-Trimethylbenzene						.0226	.0226
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water	849.1		1280.6		119.8		2249.5
	CO_2		2.469		165.5		731.8	899.769
	Total gas trapped at s.t.p.(cc)		1.8		113.4		407.2	522.4

Remarks:

TABLE VII-27
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-9-66

Date Sample Received 4-10-66 Date of Analysis 4-11-66

Sample No 66-2-4-9-2AA Sample Set 31

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane		<.00072		<.00078		<.0204	.02190
2.	Ethylene							
3	Ethane							
4.	Propane		<.00001		<.00001		.1812	.1812
5.	Vinyl Chloride						<.00001	<.00001
6.	Butane		<.0001		<.00001		.00522	.00522
7.	Acetaldehyde							
8.	Methanol	.0052		0056		.0023		.0131
9.	"Freon" MF							
10.	Ethanol	.0135		.0185		.0063		.0383
11.	n-Pentane							
12.	Acetone	.0243		.0561		.1387	.0070	.2261
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol			.0244		.0037	.0090	.0371
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane							
22.	"Freon" TF							
23.	Cyclopentene			<.00001		<.00001		<.00002
24.	4-Methyl-2-pentene							
25.	2,3-Dimethylbutane						.1844	.1844
26.	Cyclopentane							
27.	4-Metnyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane					<.00001		<.00001
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride							
42.	Benzene			<.00001	<.00001	<.00001	<.00001	<.00004
43.	Cyclohexane							
44.	Carbon Tetrachloride		<.00001					<.00001
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane						.00003	.00003

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene							
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene						<.00001	<.00001
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane							
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene	.2955						.2955
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene				<.00001			<.00001
69.	p-Xylene							
70.	m-Xylene						<.00001	<.00001
71.	o-Xylene						<.00001	<.00001
72.	2-Hexanol							
73.	n-Nonane			<.00001				<.00001
74.	Isopropylbenzene	<.00001			<.00001			<.00002
75.	1,3,5-Trimethylbenzene							
76.	tert-Butylbenzene	00265						.00265
77.	Cyclohexanol							
78.	n-Decane	.0463						.0463
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene	<.00001						<.00001
82.	Water	626.9		1234.2		75.0		1936.1
	CO_2		0.5287		7.426		153.8	161.7547
	Total gas trapped at s.t.p.(cc)		1.0		3.8		208.5	213.3

Remarks: Unidentified Peaks:

R_t 246, 0 liquid, trace peak

R_t 573, 0 liquid, trace peak

R_t 600, 0 liquid, trace peak

TABLE VII-28
ECOLOGICAL SAMPLE TEST ANALYSIS

Date Sample Taken 4-10-66

Date Sample Received 4 12-66 Date of Analysis 4-13 66

Sample No. 66-2-4-10-1BA Sample Set 34

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
1.	Methane				00009		00027	00036
2.	Ethylene							
3.	Ethane							
4.	Propane				0014		0276	0290
5.	Vinyl Chloride				< 00001		< 00001	< 00002
6.	Butane				< 00001		< 00001	<.00002
7.	Acetaldehyde							
8.	Methanol			0064		0064		.0128
9.	"Freon" MF							
10.	Ethanol			0864		.0117		0981
11.	n-Pentane							
12.	Acetone			0759		2444	.5534	8737
13.	Isoprene							
14.	2-Pentene							
15.	Diethyl Ether							
16.	Isopropanol			0235	.00026	.0065	.0040	03426
17.	2-Methyl-2-butene							
18.	1,1-Dichloroethylene							
19.	Methylene Chloride							
20.	Methyl Acetate							
21.	2,2-Dimethylbutane					<.00001		<.00001
22.	"Freon" TF							
23.	Cyclopentene							
24.	4-Methyl-2-pentene					< 00001		<.00001
25.	2,3-Dimethylbutane							
26.	Cyclopentane							
27.	4-Methyl-1-pentene							
28.	2-Methylpentane							
29.	1,1-Dichloroethane						.3114	3114
30.	3-Methylpentane							
31.	2-Methyl-1-pentene							
32.	1-Hexene							
33.	2-Ethyl-1-butene							
34.	Methyl Ethyl Ketone							
35.	n-Hexane							
36.	Chloroform							
37.	2-Hexene							
38.	Methylcyclopentane							
39.	2,4-Dimethylpentane							
40.	Tetrahydrofuran							
41.	Ethylene Dichloride					< 00001		<.00001
42.	Benzene						.0194	.0194
43.	Cyclohexane			< 00001	.0007			00071
44.	Carbon Tetrachloride							
45.	2,3-Dimethylpentane							
46.	Cyclohexene							
47.	3-Methylhexane							

	Compound	0°C (mg) Liquid	0°C (mg) Vapor	-78°C (mg) Liquid	-78°C (mg) Vapor	-175°C (mg) Liquid	-175°C (mg) Vapor	(mg) Total
48.	1-Heptene							
49.	2,2,4-Trimethylpentane							
50.	Trichloroethylene							
51.	3-Heptene				<.00001		<.00001	< 00002
52.	Heptane							
53.	2,4,4-Trimethyl-1-pentene							
54.	Methylcyclohexane							
55.	4-Methylcyclohexene							
56.	2,4,4-Trimethyl-2-pentene							
57.	2,3,4-Trimethylpentane							
58.	Toluene				<.00001		<.00001	<.00002
59.	2,2,5-Trimethylhexane							
60.	1-Octene							
61.	1-trans-2-Dimethylcyclohexane			<.00001				<.00001
62.	2,4-Pentanedione							
63.	n-Octane							
64.	Perchloroethylene							
65.	2-Octene							
66.	1-cis-2-Dimethylcyclohexane							
67.	Ethylcyclohexane							
68.	Ethylbenzene							
69.	p-Xylene							
70.	m-Xylene							
71.	o-Xylene						<.00001	<.00001
72.	2-Hexanol							
73.	n-Nonane							
74.	Isopropylbenzene						<.00001	<.00001
75.	1,3,5-Trimethylbenzene						<.00001	<.00001
76.	tert-Butylbenzene							
77.	Cyclohexanol							
78.	n-Decane							
79.	sec-Butylbenzene							
80.	p-Cymene							
81.	n-Butylbenzene							
82.	Water		No Sample	1095.6		125.8		1221.4
	CO_2		No Sample		8.266		323 9	332.166
	Total gas trapped at s.t.p.(cc)		No Sample		3.7		183 9	187 6

Remarks: No 0°C Sample

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1 ORIGINATING ACTIVITY *(Corporate author)*

Arnold Engineering Development Center
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Arnold Air Force Station, Tennessee

2a REPORT SECURITY CLASSIFICATION

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2b GROUP

N/A

3 REPORT TITLE

A TRACE CONTAMINANT ANALYSIS TEST ON AIR SAMPLES - PHASE II

4 DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Phase II

5 AUTHOR(S) *(Last name, first name, initial)*

McCabe, J. R., ARO, inc.

6 REPORT DATE	7a TOTAL NO OF PAGES	7b NO OF REFS
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11 SUPPLEMENTARY NOTES	12 SPONSORING MILITARY ACTIVITY
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13 ABSTRACT Details of transferring and concentrating contaminants from 150-cc stainless steel cryogenic traps to small volume glass traps more suitable to trace analysis and gas chromotographic equipment used in analysis, along with analysis procedures used, are presented. The chromotographic instrumentation, calibrations, and data assimilation procedures are described. Basic test results and observations concerning the utility of procedures used, along with comparative discussions of various aspects of Phase II compared with Phase I, are noted.

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
~~chemical analysis~~ 2 chromotographic analysis 1. air - - analysis 3. air samples 4-11						

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